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ELASTICITY OF FLUIDS is accounted for from their particles being all endowed with a centrifugal force; when Sir Isaac Newton (prop. xxxii. lib. 2.) demonstrates, that particles, which naturally avoid or fly off from one another by such forces as are reciprocally proportioned to the distances of their centre, will compose an elastic fluid, whose density shall be proportional to its compression; and vice versa, if any fluid be composed of particles that fly off and avoid one another, and hath its density proportional to its compression, then the centrifug [redacted] of those particles will be reciprocall [redacted] distances of their centres.

ELASTICITY OF THE AIR is the for [redacted] with that element dilates itself, upon [redacted] the force whereby it was before [redacted] See AIR and ATMOSPHERE. The [redacted] spring of the air was first discovere [redacted] Its existence is proved by this experiment of that philosopher:—An extraordinary quantity of air being intruded by a syringe into a hollow glass or metal ball, till the ball, with this accession of air, weighs considerably more in the balance than it did before; upon opening the mouth thereof, the air rushes out, till the ball sink to its former weight. From hence we argue, that there is just as much air gone out, as compressed air had been crowded in. Air, therefore, returns to its former degree of expansion, upon removing the force that compressed or resisted its expansion; consequently it is endowed with an elastic force. It must be added, that, as the air is found to rush out in every situation or direction of the orifice, ie elastic force acts every way, or in every di-ection. The doctrine of the elasticity of the ir is a considerable branch of pneumatics. The ause of this elasticity has been commonly as-ribed to a repulsion between its particles; but is can give us only a very slight idea of the ature of its elasticity. The term repulsion, like iat of attraction, requires to be defined; and in ll probability will be found in most cases to be ie effect of the action of some other fluid. hus, we find, that the elasticity of the atmo-here is very considerably affected by heat. upposing a quantity of air heated to such a gree as is sufficient to raise Fahrenheit's ther-ometer to 212°, it will then occupy a consider-ble space. If it is cooled to such a degree as to nk the thermometer to 0°, it will shrink up into ss than half its former bulk. The quantity of pulsive power, therefore, acquired by the air, ile passing from one of these states to the er, is evidently owing to the heat added to or en away from it. Nor have we any reason to ppose, that the quantity of elasticity, or repul-power, it still possesses, is owing to ... supposing repulsion to be a primary cause, inde-pendent of all others, has given rise to man erroneous theories, and been one very gre mean of embarrassing philosophers in their ac-counting for the phenomena of electricity.

ELATE, *adj.* & *v.a.* } Lat. *elatus*, part. of ver
ELA'TION, *n. s.* } *effero*, to exalt, &c.; from *e*, forth, and *fero*, *latum*, to bring. Elevated; lofty; flushed with station or dignity. The verb seems to be derived from the adjective.

> This king of kinges proud was and elat [redacted]
> Thus with new taunts insult the monster's ear.
>
> *Id. Odyssey.*

> Or truth, divinely breaking on his mind,
> *Elates* his being, and unfolds his power.
>
> *Thomson.*

> Fair was the blossom, soft the vernal sky:
> *Elate* with hope we deemed no tempest nigh:
> When lo! a whirlwind's instantaneous gust
> Left all its beauties withering in the dust.
>
> *Beattie.*

ELATE, in botany, a genus of the monœc order and triandria class: CAL. none; COR. tr petalous, with three stamina or with one pistil FRUIT an oval acuminated plum. Species on only, an Indian tree.

ELATER, in zoology, a genus of insect belonging to the order of coleoptera. The an tennæ are setaceous; and an elastic spring spine projects from the hinder extremity of th breast or under side of the thorax. By means this kind of spring, the animal, when turne upon its back, contrives to leap up into the ai and so turn itself. It varies in size; and whe the insect is young, and newly metamorphosed its elytra are of a beautiful deep red; but in few days they change to a much darker hue, an are nearly of a chestnut color. In the state larvæ it inhabits the trunks of decayed trees, an is there transformed. With the help of its wing it issues from its prison, flutters upon flowers wanders over the fields, and conceals itself thickets or under the bark of trees.

ELATERIUM, *n. s.* Lat. An inspissated juice, light, of a friable texture and an acid an pungent taste. It is procured from the fruit a wild cucumber. It is a very violent and rou purge.

ELATERIUM, Ἐλατηριον, in botany, a genus the monandria order, monœcia class of plants natural order thirty-fourth, cucurbitaceæ, male o

inferior, unilocular, and bivalved. Species one only, a common plant.

ELATH, or ELOTH, in ancient geography, a part of Idumæa, situated upon the Red Sea, which David in his conquest of Edom took, 2 Sam. viii. 14, and there established a trade to all parts of the world. Solomon built ships in Elath, and sent them thence to Ophir for gold, 2 Chron. viii. 17, 18. It continued in the possession of the Israelites about 150 years, till the time of Joram, when the Edomites revolted and recovered it, 2 Kings viii. 20; but it was again taken from them by Azariah, and by him left to his son; 2 Kings xiv. 22. In the time of his grandson Ahaz, however, Rezin king of Syria took it, Ib. xvi. 6; and the Syrians kept it long; till after many changes, under the Ptolemies, it came at last into the possession of the Romans.

ELATINE, in botany, a genus of the tetragynia order and octandria class of plants; natural order fifteenth, inundatæ: CAL. tetraphyllous; the petals four: CAPS. [illegible]locular, quadrivalved, and depres[illegible] natives of the south of Europe.

ELATOSTEMA, [illegible] a genus of the pentandria order and [illegible] class of plants; male and fem[illegible] CAL. [illegible] COR. [illegible]partite; the stamina are fiv[illegible] filaments [illegible] CARP. a very small oblong, bi[illegible] [illegible]ous capsule: SEEDS single and [illegible]-shap[illegible].

ELBA, a small island of the Mediterranean, near the coast of Tuscany, in circuit about sixty miles. Its breadth is very various; its general aspect is mountainous, and its climate mild. Here are cultivated fruits, vines, corn, and maize. The horned cattle are few, the live stock being composed of horses and mules. The exports consist of wine, fruit, and iron ore, for which the island has been noted since the days of Virgil (Æn. x. 173); there are also mines of copper, and extensive quarries. It was in 1801 vested in the possession of Tuscany, and has acquired historical celebrity as the residence of Buonaparte from May 1814 to 26th February 1815, when he sailed on his last expedition to France. It has two harbours, Porto Ferrajo, the capital, and Porto Longone. The former is remarkable for the gallant defence which was made of it, by the English against the French in 1801. Elba reverted to the grand duke of Tuscany, after the departure of Napoleon. Population about 14,000. Several islets around it are uninhabited. Long. of Porto Ferrajo, 10° 19′ 35″ E.; lat. 42° 49′ 6″ N.

ELBE, a large river of Germany, anciently the Albis, which, rising on [illegible] of Silesia, runs through Bohem[illegible] Upper Saxony, Anhalt, Magdebur[illegible], and Danneberg; and afterward[illegible] duchy of Lunenburg from that of [illegible] well as that of Bremen from Ho[illegible] the German Ocean, about sevent[illegible] burgh. It is navigable for grea[illegible] any other river in Europe, and [illegible] Magdeburg and Hamburgh 50[illegible] navigation up to Hamburgh is dif[illegible]nt of numerous sand banks, and the [illegible] violence of the wind; particularly the westerly winds which increase the bulk of the waters, and cause inundations; an easterly wind on the other hand sometimes presses its waters to the sea, and deprives the canals dependent on it of the necessary supplies. Its navigation has likewise been much impeded by the tolls imposed by the princes of the different provinces through which it passes, there having been more than thirty between Pirna in Saxony, and Hamburgh; but this has been greatly remedied of late.

ELBERFELD, a thriving town on the Wupper, in the province of Berg, district of Dusseldorf, Prussia. The manufactures of Siamoise, lace, riband, linen, and stuffs, employ the greater part of a population of 18,000 persons. Here are also hardware and bleaching establishments of considerable extent. It is eighteen miles east of Dusseldorf, and twenty north-east of Cologne.

ELBERT, a county of Georgia, on the tract of land between Tugulo and Broad rivers. The south-east corner of the county is at their confluence; on the north-west it is bounded by Franklin county. The chief town is Petersburgh.

ELBING, a trading city of Polish Prussia, in the circle of Marienburg, situated in a fruitful level, on a bay of the Baltic Sea, called the Frischaff, or Erische Haffe, near the mouth of the Vistula. The town is large, populous, and very well built. It is divided into the old and new town, which were once well fortified, but in 1772 the works were demolished. The old town has a handsome tower, with a good college. The stadthouse and the academy are fine buildings, with pleasant gardens. The best warehouses are in the suburbs. No vessels larger than 100 tons burden can approach the town; but Elbing has a good export trade in corn potash, linen, butter, and cheese; and supplies from its manufactories considerable quantities of soap, starch, oil, and tobacco to the neighbourhood. Population 16,800. It is thirty miles south-east of Dantzic, and 100 north by west of Warsaw.

ELBOEUF, a thriving manufacturing town of France, on the Seine, in Normandy. There has been a celebrated manufacture of woollen cloths here since 1667; it has also manufactures of carpets and stockings. Ten miles south of Rouen, and sixty-five north-west of Paris.

EL'BOW, *n. s.*, *v. a* [illegible] *v. n.*
EL'BOW-CHAIR, *n. s.*
EL'BOW-ROOM. } Sax. elboȝe, from elb, an ell, and boȝen, bending, the ell being originally the length of the arm, and the bend being then at the elbow. The first joint of the arm below the shoulder; any angle. As a verb active, to push with the elbow; hence, to encroach upon; to drive. As a neuter verb, to point outwards in angles; to clash with. An elbow-chair is one that accommodates the elbows: elbow-room, room to extend the elbows; space enough to act in.

> Straight will he come;
> Wear thy good rapier bare, and put it home:
> Quick, quick; fear nothing, I'll be at thy *elbow*.
> *Shakspeare. Othello.*

> Now my soul hath *elbowroom*;
> It would not out at windows nor at doors. *Id.*

Fruit trees, or vines, set upon a wall between *elbo*[illegible]

or buttresses of stone, ripen more than upon a plain wall. *Bacon.*

The natives are not so many, but that there may be *elbowroom* enough for them, and for the adventives also. *Id.*

His sleves half hid with *elbow* pinionings,
As if he meant to flie with linnen wings.
*Bp. Hall. Satires.*

He that *elbows* in all his philosophic disputes must needs be very proud of own sufficiencies.
*Mannyngham.* 1631.

If fortune takes not off this boy betimes,
He'll make mad work and *elbow* out his neighbours.
*Dryden.*

A politician must put himself into a state of liberty to provide *elbowroom* for conscience to have its full play in. *South.*

What would you say should you see the sparkler shaking her *elbow* for a whole night together, and thumping the table with a dice-box?
*Addison. Guardian.*

Swans and *elbowchairs*, in the opera of Dioclesian, have danced upon the English stage with good success. *Gay.*

In some fair evening on your *elbow* laid,
You dream of triumphs in the rural shade.
*Pope.*

But *elbows* still were wanting; these, some say,
An alderman of Cripplegate contrived;
And some ascribe the' invention to a priest,
Burly, and big, and studious of his ease.
*Cowper.*

And at his *elbow*, souter Johnny,
His ancient, trusty, drouthy crony;
Tam lo'ed him like a vera brither;
They had been fou for weeks thegither.
*Burns.*

And thus upon his *elbow* he arose,
And looked upon the lady in whose cheek
The pale contended with the purple rose,
As with an effort she began to speak. *Byron.*

ELBOW, that eminence whereon the arm rests, is by the Latins called cubitus, and the Greeks αγκων and ολεκρανον. See ANATOMY.

ELCESAITES, in church history, a sect of heretics, who appeared in the reign of Trajan. They worshipped one God, observed the Jewish sabbath, circumcision, and the other ceremonies of the law; but they rejected the Pentateuch, the prophets, and the writings of the apostles, particularly those of St. Paul.

ELCHE, a large town of Spain, in the province of Valencia, situated in a plain, abounding with palm trees. It was the Illici of the Romans, and has still an ancient ducal palace. It has also some good streets and squares, but its general aspect is dull. The great church is a fine building, with a noble dome, and the barracks extensive and well built. There are here several poor houses and convents; the man[illegible]factures are confined to soap and leather, whic[illegible] with dates, palms, and other fruit of the nei[illegible]bourhood, constitute its articles of trade. [illegible] has several marble fountains. Population 18,[illegible]

ELD, *v.a.*, *v.n.* & *n.s.*
EL'DER, *adj.* & *n. s.*
EL'DERLY, [illegible]*v.*
EL'DERSH[illegible], *n. s.*
EL'DEST[illegible]

Sax. ealð; Scot. Goth. *ald*, from 'the [illegible]. verb ylðan, or ılðan, to remain, stay, continue, last, endure, delay, defer,' says Mr. Tooke, 'of which it is the past participle.' Chaucer uses eld, however, both as a verb active and neuter: see below: as a substantive, it signifies old age; decrepitude; and hence, old people. It is clearly the parent of our adjective OLD, which see, and in elder, eldest, we retain the original comparative and superlative. Elder, as a substantive, expresses seniority of age or office: it is also the name of a tree. Eldership is seniority, primogeniture. Elderly, approaching old age.

Elizabeth thi cosyn,—sche also hath conseyved a sone in hir *celde*, and this monethe is the sixte to hir that is clepid bareyn. *Wiclif. Luke* i.

[illegible] *elder*, but intreat him as a father, [illegible] men as brethren. 1 *Tim.* v. 1.

[illegible] time eke that ychaungith all,
[illegible] all doth waxe and fostrid be,
[illegible] alle thing destroith he;
The time that *eldith* our ancestours,
And *eldith* kings and emperours.
*Chaucer. Romaunt of the Rose.*

The time that hath alle in welde
To *elden* folke had made her *elde*. *Id.*

For *elde* is comen unwarely upon me, hasted by the harmes that I have, and sorowe hath commaunded his [illegible] be in me. *Colvile.*

[illegible] with joy unwonted inly sweld,
[illegible] comfort in her weaker *eld*.
*Spenser. Faerie Queene.*

[illegible] very superstitious and diligent obser[illegible]s, which they received by continual [illegible] from their parents, by recording of their bards and chronicles, in their songs, and by daily use and ensample of their *elders*.
*Id. Ireland.*

At the board, and in private, it very well becometh children's innocency to pray, and their *elders* to say Amen. *Hooker.*

The controversy sprang up between Beza and Erastus, about the matter of excommunications, whether there ought to be in all churches an *eldership*, having power to excommunicate, and a part of that *eldership* to be of necessity certain chosen out from amongst the laity. *Id.*

Thy blazed youth,
Becomes assuaged, and doth beg the alms
Of palsied *eld*. *Shakspeare.*

Let still the woman take
An *elder* than herself; so wears she to him,
So sways she level in her husband's heart. *Id.*

Our *elders* say,
The barren, touched in this holy chase,
Shake off their steril curse. *Id.*

We will establish our estate upon
Our *eldest* Malcolm, whom we name hereafter
The prince of Cumberland. *Id.*

Among the Lacedemonians, the chief magistrates, as they were, so were they called, *elder* men.
*Raleigh.*

[illegible]unkenness] possesseth a man, the [illegible] in it, and the *elder* he groweth [illegible] subject to it. *Id.*

[illegible] youth their virtuous awe disclose,
[illegible] their seats the reverend *elders* rose.
*Sandys.*

He thought it touched his deity full near,
If likewise he some fair one wedded not,
Thereby to wipe away the' infamous blo[illegible]
Of long uncoupled bed and childless *eld*.
*Milton.*

The *elder* of his children comes to acquire a degree of authority among the younger, [illegible] the same means the father did among them. *Temple.*

The mother's and her *eldest* daughter's grace,
It seems, had bribed him to prolong their space.
*Dryden.*

That all should Alibech adore, 'tis true:
But some respect is to my birthright due:
My claim to her by *eldership* I prove. *Id.*

Nor were the *eldership*
Of Artaxerxes worth our least of fears,
If Memnon's interest did not prop his cause.
*Rowe.*

Says the goose, If it will be no better, e'en carry your head as your *elders* have done before you.
*L'Estrange.*

*Eldest* parents signifies either the oldest men and women that have had children, or those who have longest had issue. *Locke.*

Flea-bitten synod, an assembly brewed
Of clerks and *elders* ana; like the rude
Chaos of presbytry, where laymen ride
With the tame woolpack clergy by their side.
*Cleveland.*

The branches are full of pith, having but little wood: the flowers are monopetalous, divided into several segments, and expand in form of a rose: these are, for the most part, collected into an [illegible]el, and are succeeded by soft succulent berries, [illegible]g three seeds in each. *Mill[illegible]*

They count him of the green-ha[illegible]
Fame's high temple sta[illegible]
Stupendous pile; not reared by [illegible]
Whate'er proud Rome, or artful [illegible]
Or *elder* Babylon, its frame excelled. [illegible]*pe.*

I lose my patience, and I own it too,
Where works are censured, not as bad, but new;
While, if our *elders* break all reason's laws,
Those fools demand not pardon but applause. *Id.*

With musing-deep, astonished stare,
I viewed the heavenly-seeming fair;
A whispering throb did witness bear,
Of kindred sweet,
When with an *elder* sister's air
She did me greet. *Burns.*

ELDER, in botany. See SAMBUCUS.

ELDERS, or SENIORS, in ancient Jewish polity, were persons the most considerable for age, experience, and wisdom. Of this sort were the seventy men whom Moses associated with himself in the government; such, likewise, afterwards were those who held the first rank in the synagogue, as presidents.

ELDERS, in the Presbyterian discipline, are officers, who, in conjunction with the ministers and deacons, compose the kirk-session, which formerly used to inspect and regulate matters of religion and discipline; but whose principal business now is to take care of the poor's funds. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of elders in each parish; generally about twelve.

When a vacancy happens, it is filled up by an election made by the remaining members of the session. There is no legal limitation of the number of elders: but the general understanding is, that they are not to be multiplied unnecessarily, and as their office is a gratuitous one, and is attended with some little trouble, there is never much temptation to increase them, except when there is some particular point to be carried. They are commonly selected out of that respectable class of persons who are above the lower orders, and yet rather below the higher rank of the society c the place, though there is no definite rule, an no absolute exclusion of any body, whose cir cumstances and character are respectable. Th heritors are the proprietors of the real property within the parish. It is by them and thei tenants that the sum raised for the maintenance of the poor, called the assessment, must be paid. This assessment is divided between the proprietors, and the tenants, according to rules which it is needless to explain here; but the general import of which is, that the proprietors are entitled to obtain relief of what is laid upon them, to the extent of one-half, from their lessees. These heritors are conjoined with the kirk-sessions, in the administration of the poor's funds; that is, they are legally entitled to act along with them, but, as the first report by the general assembly states, 'the heritors, in practice, seldom or never interfere in regulating the concerns of the poor or the poor's funds, except in parishes where assessments are levied.' The ordinary funds for the support of the poor, consist of the alms collected at the church door, parochial fines, and other dues, and any sum that may have been gifted to [illegible] parish. The last are commonly small; so [illegible]he chief fund arises from the church-door [illegible]ollections. The direct tax, called an assessment, is only resorted to when these resources fail. It is in this apparatus that the excellence of the Scottish system is said to consist.

The elders are held to be a class of persons admirably fitted for investigating every claim that can be made for admission upon the poor's-roll. They reside within the parish; they either know the claimant personally, or can easily inquire into his character and circumstances; and they are in that station of life to which such an employment, instead of being nauseous, is a fair ground of parochial power and importance.

ELEATIC PHILOSOPHY, among the ancients, a name given to that of the stoics, because taught at Elea.

ELEATIC SECT. The founder of this sect of philosophers is supposed to have been Xenophanes, who lived about the fifty-sixth Olympiad, or about A. A. C. 350. It was divided into two parties, which may be denominated metaphysical and physical; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno of Elea. They are supposed to have maintained principles similar to those of Spinoza; they held the eternity and immutability of the world; that whatever existed was only one being; that there was neither any generation nor corruption; that this one being was immoveable and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe or the one being, not the material world, but the originating principle of all things, or the true God, whom they expressly affirm to be incorporeal. Thus Simplicius represents them as merely metaphysical writers, who distinguished between things

natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides also distinguished between the doctrine concerning metaphysical objects, called truth, and that concerning physical or corporeal things, called opinion; with respect to the former, there was one immoveable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic sect were the atomic philosophers, who formed their system from an attention to the phenomena of nature; of these the most considerable were Leucippus, Democritus, and Protagoras.

ELECAMPA'NE, *n. s.* Lat. *helenium.* A plant, named also starwort. Botanists enumerate thirty species of this plant.

The Germans have a method of candying *elecampane* root like ginger, to which they prefer it, and call it German spice. *Hill's Materia Medica.*

ELECAMPANE, in botany. See INULA.

ELECT, *v. a., n. s.,* & *adj.*
ELEC'TION, *n. s.*
ELEC'TIONEERING,
ELEC'TIVE, *adj.*
ELEC'TIVELY, *adv.*
ELEC'TOR, *n. s.*
ELEC'TORAL, *adj.*
ELEC'TORATE, *n. s.*
ELEC'TORESS,
ELEC'TRESS.

Fr. *elire*; Ital. *eleggere*; Span. *elegir*; Port. *eleger*; Lat. *electus, eligere.* To choose; select: used, theologically, for God's choice of his Son, the Jews, Christians, &c.: and in the same sense, as a substantive, for the party or parties chosen. An election, politically, is the ceremony of choosing, or too often of returning only, members of parliament: electioneering, the business, solicitations, or practices, whereby such returns are procured: elective, regulated, or bestowed, by election; exerting choice: elector, one who has a right, or power, to choose to office, or otherwise: electoral, having the right or dignity of elector, applied, in a particular sense, to certain German princes, who[illegible]dominions are called their electorate: electoress, or electress, is the wife, or widow, of an electoral prince.

Behold my servant whom I uphold, mine *elect* in whom my soul delighteth. *Bible. Isa.* xlii. 1.

Who shall lay any thing to the charge of God's *elect?* *Id. Rom.* viii. 33.

If the *election* of the minister should be committed to every several parish, do you think that they would chuse the meetest? *Whitgift.*

You have here, lady,
And of your choice, these reverend fathers,
Yea, the *elect* of the land, who are assembled
To plead your cause. *Shakspeare. Henry VIII.*

The wisdom of nature is better than of books: prudence being a wise *election* of those things which never remain after one and the self-same manner. *Raleigh.*

The discovering of these colours cannot be done but out of a very universal knowledge of things: which so cleareth men's judgment and *election* as it is the less apt to slide into error. *Bacon.*

I will say positively and resolutely, that it is impossible an *elective* monarchy should be so free and absolute as an hereditary.

For what is man without a moving mind,
Which hath a judging wit, and chusing will?
Now if God's power should her *election* bind,
Her motions then would cease, and stand all still.
*Davies.*

I was sorry to hear with what partiality, and popular heat, *elections* were carried in many places. *King Charles.*

It could not but be a great comfort to Aaron, to see his rod thus miraculously flourishing; to see this wonderful testimony of God's favour and *election.* *Bp. Hall's Contemplations.*

Henry his son is chosen king, though young;
And Lewis of France, *elected* first, beguiled.
*Daniel.*

A vicious liver, believing that Christ died for none but the *elect*, shall have attempts made upon him to reform and amend his life. *Hammond.*

Some I have chosen of peculiar grace,
*Elect* above the rest; so is my will. *Milton.*

Him, not thy *election,*
But natural necessity, begot. *Id.*

F[illegible]m the new world her silver and her gold
C[illegible] like a tempest, to confound the old;
[illegible]g with these the bribed *electors'* hopes,
A[illegible]he gave us emperors and popes. *Waller.*

To [illegible]f compelling a man to be good, is a contradiction; for where there is force, there can be no choice: whereas all moral goodness consisteth in the *elective* act of the understanding will. *Grew's Cosmologia Sacra.*

They work not *electively*, or upon proposing to themselves an end of their operations. *Id.*

Thus while they speed their pace, the prince designs
The new *elected* seat, and draws the lines. *Dryden.*

The last change of their government, from *elective* to hereditary, has made it seem hitherto of less force, and unfitter for action abroad. *Temple.*

Thus to regulate candidates and *electors*, and new-model the ways of *election*, what is it but to cut up the government by the roots, and poison the very fountain of public security? *Locke.*

How or why that should have such an influence upon the spirits, as to drive them into those muscles *electively*, I am not subtle enough to discern. *Ray on the Creation.*

As charity is, nothing can more increase, the lustre and beauty than a prudent *election* of objects, and a fit application of it to them. *Sprat.*

You see in *elections* for members to sit in parliament, how far saluting rows of old women, drinking with clowns, and being upon a level with the lowest part of mankind, in that wherein they themselves are lowest, their diversions, will carry a candidate. *Steele.*

He h[illegible] a great and powerful king for his son-in-law[illegible]d can himself command, when he pleases, the whole [illegible]rength of an *electorate* in the empire. *Addison's Freeholder.*

Since the late dissolution of the club, many persons put up for the next *election.* *Id. Spectator.*

He calls upon the sinners to turn themsel[illegible]and live; he tells us that he has set before us life a[illegible]d death, and referred it to our own *election* which we will chuse. *Rogers.*

The conceit about absolute *election* to eter[illegible] life, some enthusiasts entertaining, hav[illegible] been made re[illegible] in the practice of virtue. *Atterbury.*

This prince, in gratitude to the people, by whose consent he was chosen, elected a hundred senators out of the commoners. *Swift.*

Lo! serve us on sudden,
In shape of porter, beef, and pudding,
Though like *electioneering* comes,
Strike up ye trumpets and ye drums! *Warton.*

Many an honest man, before as harmless as a tame rabbit, when loaded with a single *election* dinner, has become more dangerous than a charged culverin. *Goldsmith.*

Counties could neither be purchased nor intimidated. But their solemn determined *election* may be rejected; and the man they detest may be appointed by another choice, to represent them in parliament. *Junius.*

Man, thus endued with an *elective* voice,
Must be supplied with objects of his choice;
Where'er he turns, enjoyment and delight,
Or present, or in prospect, meet his sight. *Cowper.*

There are not, in this island, one million of persons who have a vote in *electing* parliament-men: and yet, in this island, there are eight millions of persons who must obey the law. *Beattie.*

The act of parliament settled the crown on the *electress* Sophia and her descendants. *Burke.*

Election, in British polity, is the choice of their representatives in parliament. See Parliament. In this consists the exercise of the democratical part of our constitution: for in a democracy there can be no exercise of sovereignty but by suffrage, which is the declaration of the people's will. In all democracies, therefore, it is of the utmost importance to regulate by whom and in what manner, the suffrages are to be given. And the Athenians were so justly jealous of this prerogative, that a stranger, who interfered in the assemblies of the people, was punished with death, being esteemed guilty of high treason, by usurping those rights of sovereignty to which he had no title. 'In Britain,' says Blackstone, 'where the people do not debate in a collective body, but by representation, the exercise of this sovereignty consists in the choice of representatives. The laws have therefore very strictly guarded against the usurpation or abuse of this power, by many salutary provisions; which may be reduced to these three points, 1. The qualifications of the electors. 2. The qualifications of the elected. 3. The proceedings at elections.

*As to the Qualification of Electors.*—The true reason of requiring any qualification, with regard to property, in voters, is to exclude such persons as are in so mean a situation, that they are esteemed to have no will of their own. If these persons had votes, they would be tempted to dispose of them under some undue influence or other. This would give a great, an artful or a wealthy man, a larger share in elections than is consistent with general liberty. If it were probable that every man would give his vote freely, and without influence of any kind; then, upon the true theory and genuine principles of liberty, every member of the community, however poor, should have a vote in electing those delegates to whose charge is committed the disposal of his property, his liberty, and his life. But since that can hardly be expected in persons of indigent fortunes, or such as are under the immediate dominion of others, all popular states have been obliged to establish certain qualifications; whereby some, who are suspected to have no will of their own, are excluded from voting, in order to set other individuals, whose will may be supposed independent, more thoroughly upon a level with each other. And this constitution of suffrages is framed upon a wiser principle, with us, than either of the methods of voting, by centuries or by tribes, among the Romans. In the method by centuries, instituted by Servius Tullius, it was principally property, and not numbers, that turned the scale; in the method by tribes, gradually introduced by the tribunes of the people, numbers only were regarded, and property entirely overlooked. Hence the laws passed by the former method had usually too great a tendency to aggrandise the patricians or rich nobles: and those by the latter had too much of a levelling principle. Our constitution steers between the two extremes. Only such are entirely excluded as can have no will of their own: there is hardly a free agent to be found, but what is entitled to a vote in some place or other in the kingdom. Nor is comparative wealth or property entirely disregarded in elections; for though the richest man has only one vote at one place, yet, if his property be at all diffused, he has probably a right to vote at more places than one, and therefore has many representatives. This is the spirit of our constitution: not that we assert it is in fact so perfect as we have endeavoured to describe it; for, if any alteration might be wished or suggested in the present form of parliaments, it should be in favor of a more complete representation of the people. But to return to the qualifications; and first, those of elections for knights of the shire. 1. By stat. 8 Hen. VI. c. 7 and 10, Hen. VI. c. 2. (amended by 14 Geo. III. c. 58), the knights of the shire shall be chosen of people, whereof every man shall have freehold to the value of forty shillings by the year within the county; which (by subsequent statutes) is to be clear of all charges and deductions, except parliamentary and parochial taxes. The knights of shires are the representatives of the landholders, or landed interests of the kingdom: their electors must therefore have estates in lands or tenements within the county represented. These estates must be freehold, that is, for term of life at least; because beneficial leases for long terms of years were not in use at the making of these statutes, and copyholders were then little better than villeins, absolutely dependent upon their lords. This freehold must be of forty shillings annual value; because that sum would then, with proper industry, furnish all the necessaries of life, and render the freeholder, if he pleased, an independent man; for bishop Fleetwood, in his Chronicon Pretiosum, written at the beginning of the eighteenth century, has fully proved forty shillings in the reign of Henry VI. to have been equal to £12 per annum in the reign of queen Anne; and, as the value of money is very considerably lowered since the bishop wrote, we may fairly conclude, from this and other circumstances, that what was equivalent to £12 in his days, is equivalent to £30 at present. The other

less important qualifications of the electors for counties in England and Wales, may be collected from the statutes 7 and 8 Will. III. c. 25; 10 Ann. c. 23; 2 Geo. II. c. 21; 18 Geo. II. c. 18; 31 Geo. II. c. 14; 3 Geo. III. c. 24, which direct, 2. That no person under twenty-one years of age, shall be capable of voting for any member. This extends to all sorts of members as well for boroughs as counties; as does also the next, viz. 3. That no person convicted of perjury, or subornation of perjury, shall be capable of voting in any election. 4. That no person shall vote in right of any freehold, granted to him fraudulently to qualify him to vote. Fraudulent grants are such as contain an agreement to recovery, or to defeat the estate granted; which agreements are made void, and the estate is absolutely vested in the person to whom it is so granted. And, to guard the better against such frauds, it is farther provided, 5. That every voter shall have been in the actual possession, or receipt of the profits, of his freehold to his own use for twelve calendar months before: except it came to him by descent, marriage, marriage-settlement, will, or promotion to a benefice or office. 6. That no person shall vote in respect of an annuity or rent-charge, unless registered with the clerk of the peace twelve calendar months before. 7. That in mortgaged or trust-estates, the person in possession, under the above-mentioned restrictions, shall have the vote. 8. That only one person shall be admitted to vote for any one house or tenement, to prevent the splitting of freeholds. 9. That no estate shall qualify a voter, unless the estate has been assessed to some land-tax and, at least twelve months before the election. 10. That no tenant by copy of court-roll shall be permitted to vote as a freeholder. Thus much for the electors in counties. As for the electors of citizens and burgesses, these are supposed to be the mercantile part or trading interest of this kingdom. But as trade is of a fluctuating nature, and seldom long fixed in a place, it was formerly left to the crown to summon pro re nata, the most flourishing towns to send representatives to parliament. So that as towns increased in trade, and grew populous, they were admitted to a share in the legislature. But the misfortune is, that the deserted boroughs continued to be summoned, as well as those to whom their trade and inhabitants were transferred; except a few which petitioned to be eased of the expense, then usual, of maintaining their member; four shillings a-day being allowed for a knight of the shire, and two shillings for a citizen or burgess; which was the rate or wages established in the reign of Edward III. Hence the members for boroughs now bear above a quadruple proportion to those for counties; and the number of parliament men is increased since Fortescue's time, in the reign of Henry VI., from 300 to upwards of 500, exclusive of those for Scotland. The universities were, in general, not empowered to send burgesses to parliament; though once, in 28 Edw. I. when a parliament was summoned to consider of the king's right to Scotland, there were issued writs, which required the university of Oxford to send up four or five, and that of Cambridge two or three, of their most discreet and learned lawyers for that purpose. But it was king James I. who indulged them with the permanent privilege to send constantly two of their own body to serve; for those students, who, though useful members of the community, were neither concerned in the landed nor the trading interest; and to protect in the legislature the rights of the republic of letters. The right of election in boroughs is various, depending entirely on the several charters, customs, and constitutions of the respective places, which has occasioned infinite disputes: though now, by statute 2 Geo. II. c. 24, the right of voting for the future shall be allowed according to the last determination of the house of commons concerning it; and, by statute 3, Geo. III. c. 15. no freeman of any city or borough (other than such as claim by birth, marriage, or servitude,) shall be entitled to vote therein, unless he has been admitted to his freedom twelve calendar months before. See BOROUGH.

2. *As to the Qualifications of Persons to be elected.*—Some of the qualifications to be elected members of the house of commons depend upon the la[illegible]and custom of parliaments, declared by the [illegible]e; others upon certain statutes. And from [illegible] it appears, 1. That they must not be aliens [illegible]n or minors. 2. That they must not be any of the twelve judges, because they sit in the lords' house; nor of the clergy, for they sit in the convocation; nor persons attainted of treason, or felony, for they are unfit to sit any where. 3. That sheriffs of counties, and mayors and bailiffs of boroughs, are not eligible in their respective jurisdictions, as being returning officers; but that sheriffs of one county are eligible to be knights of another. 4. That, in strictness, all members ought to have been inhabitants of the places for which they are chosen; but, this having been long disregarded, was at length entirely repealed by statute 14 Geo. III. c. 58. 5. That no persons concerned in the management of any duties or taxes created since 1692, except the commissioners of the treasury, nor any of the officers following (viz. commissioners of prizes, transports, sick and wounded, wine-licenses, navy, and victualling; secretaries, or receivers of prizes; comptrollers of the army accounts; agents for regiments; governors of plantations, and their deputies; officers of Minorca or Gibraltar; officers of the excise and customs; clerks or deputies in the several offices of the treasury, exchequer, navy, victualling, admiralty, pay of the army or navy, secretaries of state, salt, stamps, appeals, wine-licenses, hackney-coaches, hawkers, and pedlars,) nor any person that holds any new office under the crown, created from 1705, are capable of being elected, or sitting as members. 6. That no person having a pension under the crown during pleasure, or for any term of years, is capable of being elected or sitting. 7. That if any member accepts an office under the crown, except an officer in the army or navy accepting a new commission, his seat is void; but such member is capable of being re-elected. 8. That all knights of the shire shall be actual knights, or such notable squires and gentlemen as have estates

sufficient to be knights, and by no means of the degree of yeomen. This is reduced to a still greater certainty, by ordaining, 9. That every knight of a shire shall have a clear estate of freehold or copyhold to the value of £600 per annum, and every citizen and burgess to the value of £300, except the eldest sons of peers and of persons qualified to be knights of shires, and except the members for the two universities: which somewhat balances the ascendant which the boroughs have gained over the counties, by obliging the trading interest to make choice of landed men: and of this qualification the member must make oath, and give in the particulars in writing, at the time of his taking his seat. But, subject to these standing restrictions and disqualifications, every subject of the realm is eligible of common right: though there are instances, wherein persons in particular circumstances have forfeited that common right, and have been declared ineligible for that parliament, by a vote of the house of commons; or for ever, by an act of the legislature. But it was an unconstitutional prohibition, which was grounded on an ordinance of the house of lords, and inserted in the king's writs, for the parliament holden at Coventry, 6 Henry IV., that no apprentice or other man of the law should be elected knight for the shire therein; in return for which, our law books and historians have branded this parliament with the name of parliamentum indoctum, or the lack-learning parliament; and Sir Edward Coke observes, with some spleen, that there was never a good law made thereat.

With respect to the clergy, their right or capacity of sitting in parliament was for a long time contested; but at length, by 41 Geo. III. (U. K.) c. 63. it was enacted, that no person having been ordained to the office of priest or deacon, or being a minister of the Church of Scotland, shall be capable of being elected to serve in parliament as a member of the house of commons. The election of such persons is declared void; and if any person after his election is ordained, he must vacate his seat. The penalty for any person sitting as a member, contrary to this act, is £500 a-day: and proof of having celebrated divine service is declared prima facie evidence of the party's being ordained, &c.

3. *Respecting the method of proceeding.*—The third point regarding elections, is the method of proceeding therein. This is also regulated by the law of parliament, and by various statutes, all of which we shall blend together, and extract out of them a summary account of the method of proceeding to elections. As soon as the parliament is summoned, the lord chancellor, (or, if a vacancy happens during the sitting of parliament, the speaker, by order of the house, and without such order, if a vacancy happens by death in the time of a recess for upwards of twenty days,) sends his warrant to the clerk of the crown in chancery; who thereupon issues out writs to the sheriff of every county, for the election of all the members to serve for that county, and every city and borough therein. Within three days after the receipt of this writ, the sheriff is to send his precept, under his seal, to the proper returning officers of the cities and boroughs, commanding them to elect their members: and the said returning officers are to proceed to election within eight days from the receipt of the precept, giving four days notice of the same; and to return the persons chosen, together with the precept, to the sheriff. But elections of knights of the shire must be proceeded to by the sheriffs themselves in person, at the next county-court that shall happen after the delivery of the writ. The county-court is a court held every month or oftener by the sheriff, intended to try little causes not exceeding the value of 40s., in what part of the county he pleases to appoint for that purpose: but, for the election of knights of the shire, it must be held at the most usual place. If the county-court falls upon the day of delivering the writ, or within six days after, the sheriff may adjourn the court and election to some other convenient time, no longer than sixteen days, nor shorter than ten; but he cannot alter the place without the consent of all the candidates: and, in all such cases, ten days public notice must be given of the time and place of the election. And as it is essential to the very being of parliament that elections should be absolutely free, therefore all undue influences upon the electors are illegal, and strongly prohibited. As soon, therefore, as the time and place of election, either in counties or boroughs, are fixed, all soldiers quartered in the places are to remove, at least one day before the election, to the distance of two miles or more: and not to return till one day after the poll is ended. Riots likewise have been frequently determined to make an election void. By vote also of the house of commons, to whom alone belongs the power of determining contested elections, no lord of parliament, or lord-lieutenant of a county, has any right to interfere in the election of commoners; and, by statute, the lord warden of the cinque-ports shall not recommend any members there. If any officer of the excise, customs, stamps, or certain other branches of the revenue, presumes to intermeddle in elections, by persuading any voter or dissuading him, he forfeits £100, and is disabled to hold any office. Thus are the electors of one branch of the legislature secured from any undue influence from either of the other two, and from all external violence and compulsion. But the greatest danger is that in which themselves co-operate by the infamous practice of bribery and corruption. To prevent which it is enacted, that no candidate shall, after the date (usually called the teste) of the writs, or after the vacancy, give any money or entertainment to his electors, or promise to give any, either to particular persons, or to the place in general, in order to his being elected, on pain of being incapable to serve for that place in parliament. And if any money, gift, office, employment, or reward, be given or promised to be given, to any voter, at any time, in order to influence him to give or withhold his vote, as well he that takes as he that offers such bribe forfeits £500, and is for ever disabled from voting and holding any office in any corporation: unless, before conviction, he will discover some other offender of the

same kind, and then he is indemnified for his own offence. The first instance that occurs of election bribery, was so early as 13 Eliz., when one Thomas Longe acknowledged that he had given the returning officer and others of the borough for which he was chosen the sum of £4 to be returned member, and was for that premium elected. But for this offence the borough was amerced, the member was removed, and the officer fined and imprisoned. But as this practice has since taken much deeper and more universal root, it has occasioned the making of various statutes; to complete the efficacy of which, there is nothing wanting but resolution and integrity to put them in strict execution. Undue influence being thus guarded against, the election is to be proceeded to on the day appointed; the sheriff or other returning officer first taking an oath against bribery, and for the due execution of his office. The candidates likewise, if required, must swear to their qualification, and the electors in counties to theirs; and the electors both in counties and boroughs are also compellable to take the oath of abjuration, and that against bribery and corruption.

The principal British statutes on this subject are: 7 H. 4. c. 15: 8 H. 6. c. 7; 23 H. 6. c. 14; 2 W. & M. stat. 1. c. 7; 5 & 6 W. & M. c. 20; 7 W. III. c. 4; 7 & 8 W. III. cc. 7, 25; 10 & 11 W. III. c. 7; 12 & 13 W. III. c. 10; 6 Ann. c. 23; 9 Ann. c. 5; 10 Ann. cc. 19, 33; 2 Geo. II. c. 24; 8 Geo. II. c. 30; 18 Geo. II. c. 18; 19 Geo. II. c. 28; 10 Geo. III. c. 16; 11 Geo. III. c. 42; 28 Geo. III. c. 52.

The election being closed, the returning officer in boroughs returns his precept to the sheriff, with the persons elected by the majority: and the sheriff returns the whole, together with the writs for the county and the knights elected thereupon, to the clerk of the crown in chancery; before the day of meeting, if it be a new parliament, or within fourteen days after the election, if it be an occasional vacancy; and this under penalty of £500. If the sheriff does not return such knights only as are duly elected, he forfeits, by the old statutes of Henry VI., £100; and the returning officer in boroughs, for a like false return, £40; and they are besides liable to an action, in which double damages shall be recovered, by the later statues of king William; and any person bribing the returning officer shall also forfeit £300. But the members returned by him, are the sitting members, until the house of commons, upon petition, shall adjudge the return to be false and illegal. The form and manner of proceeding upon such petition are regulated by statute 10 Geo. III. c. 16. (amended by 11 Geo. III. c. 42, and made perpetual by 14 Geo. III. c. 15), which directs the method of choosing by lot a select committee of fifteen members, who are sworn well and truly to try the same, and a true judgment to give, according to the evidence. See PARLIAMENT.

Since the beginning of the reign of Henry VIII., the number of the representatives of the commons has been more than doubled. In his first parliament the house consisted only of 298 members; 360 have since been added by acts of parliament, or by the king's charter, either creating [illegible] or reviving old boroughs. Under the provisions of the acts 27 Hen. VIII. c. 26. sect. 29, and [illegible] & 35 Hen. VIII. c. 26. sect. 27., there were added twenty-four for Wales; twelve precisely by the first act for the counties, and twelve under the provision of the latter act for the boroughs. Two for the county, and two for the city of Chester, were added by stat. 34, 35, Hen. VIII. c. 13. Two for the county, and two for the city of Durham, by stat. 25 Car. II. c. 9. Forty-five for Scotland, by the acts of union with that kingdom; and 100 for Ireland, by the acts of union with that kingdom; and the remainder by charter.

The number of the house of commons may therefore be stated thus:—

| | Members. |
|---|---|
| In the first parliament of Hen. VIII. | 298 |
| Created since by positive statute | 168 |
| Created or restored by charter, &c.: viz.—By Hen. VIII. 16: by Edw. VI. 48: Mary, 21: Eliz. 60: Jac. I. 27: Car. I. 18: Car. II. 2 | 192 |
| Total | 658 |

Of these, there are elected, under the provisions of the reform act, of 1832,

| | |
|---|---|
| For England | 471 |
| — Ireland | 105 |
| — Scotland | 53 |
| — Wales | 29 |
| Total | 658 |

The number of places which send members, and the numbers of knights, citizens, burgesses, and barons, respectively sent by the several counties, cities, boroughs, and places throughout the united kingdom, will appear by the following statement:—

| | | Counties. | Members. | |
|---|---|---|---|---|
| 117 counties | England | 40 | 143 | Knights (in Scotland, also called commissioners) of shires. |
| | Ireland | 32 | 64 | |
| | Scotland | 33 | 30 | |
| | Wales | 12 | 15 | |
| | Total | 117 | 252 | |

Brought forward, Counties 117. Members 252.

| | | | | Citizens. | |
|---|---|---|---|---|---|
| 33 cities | England | 23 | 2 each | 46 | |
| | | 1 | 4 — | 4 | |
| | Ireland | 4 | 2 each | 8 | |
| | | 3 | 1 each | 3 | |
| | Scotland | 2 | 2 | 4 | |
| | | | | — | 65 |

| | | | | Burgesses | |
|---|---|---|---|---|---|
| 210 boroughs, large towns, and districts | England | 160 | | 274 | |
| | Ireland | 26 | | 28 | |
| | Scotland | 19 | | 19 | |
| | Wales | 14 | | 14 | |
| 3 universities | England | 2 | 2 each | 4 | |
| | Ireland | 1 | 2 | 2 | |
| — | | | | —— | 341 |
| 372 places choose | | | | | 658 members. |

The most important changes effected by the reform bill consist in the disfranchisement of fifty-six boroughs, in Cornwall and elsewhere, whose constituency was insignificant, and the transfer of the elective franchise to [illegible], large and populous manufacturing towns. By this arrangement, Manchester, Birmingham, Leeds, Sheffield, Sunderland, Devonport, Wolverhampton, Bolton, Bradford, Blackburn, Halifax, Macclesfield, Oldham, Stockport, Stoke-upon-Trent, Stroud, and Brighton return two members each to parliament; and the following places, Ashton, Bury, Chatham, Cheltenham, Dudley, Frome, Gateshead, Huddersfield, Kidderminster, Kendal, Rochdale, Salford, South Shields, Tynemouth, Wakefield, Walsall, Warrington, Whitby, Whitehaven, and Merthyr-Tydvil, are privileged to elect one member each. The districts of Lambeth, Marylebone, Finsbury, and the Tower Hamlets were erected into boroughs, returning two members each; and five members are added to the Irish representation, viz. one additional to the following places, the Dublin university, Belfast, Galway, Limerick, and Waterford; the boundaries of boroughs and districts are extended, and new places admitted as contributary both in Wales and Scotland.

Election of Ecclesiastical Persons. Elections for the dignities of the church ought to be free, according to the stat. 9 Ed. II. cap. 14. If any persons that have a voice in elections, take any reward for an election in any church, college, school, &c., the election shall be void. And if any persons of such societies resign their places to others for reward, they incur a forfeiture of double the sum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. c. 6.

Election of Scottish Peers. See Peers.

Election of Verderors of the Forest (electionæ viridariorum forestæ), in law, a writ that lies for the choice of a verderor, where any of the verderors of the forest are dead, or removed from their offices. This writ is directed to the sheriff, and the verderor is to be elected by his freeholders of the county, in the same manner as coroners. *New. Nat. Brev.* 366.

Elector (in Germ. churfüst, kurfüst, or wahlfürst) was even in recent times a title of several princes of the German empire of considerable power and dignity. 'During a long period,' says Dr. Robertson (Hist. Charles V.), 'all the members of the Germanic body had a right to assemble, and to make choice of the person whom they appointed to be their head. But, amidst the violence and anarchy which prevailed for several centuries in the empire, seven princes who possessed the most extensive territories, and who had obtained an hereditary title to the great offices of the state, acquired the exclusive privilege of nominating the emperor. This right was confirmed to them by the golden bull of Charles IV.; the mode of exercising it was ascertained, and they were dignified with the appellation of electors. The nobility and free cities being thus stripped of a privilege which they had once enjoyed, were less connected with a prince towards whose elevation they had not contributed by their suffrages, and came to be more apprehensive of his authority. The electors, by their extensive power, and the distinguishing privileges which they possessed, became formidable to the emperors, with whom they were placed almost on a level in several acts of jurisdiction. Thus the introduction of the electoral college into the empire, and the authority which it acquired, instead of diminishing, contributed to strengthen, the principles of hostility and discord in the Germanic constitution.'

The seven princes above alluded to were the three ecclesiastical princes, the archbishop of Cologne, Mentz, and Treves; and the four secular, the count Palatine, the king of Bohemia, the marquis of Brandenburgh, and the duke of Saxony.

In 1648 the duke of Bavaria took the place of the count Palatine, who was outlawed by the emperor for having accepted the crown of Bohemia; but he was at length restored to his rank, and a new electoral dignity was created for the former, which increased the number of electors to eight. In 1692 a ninth electorate was added by the emperor Leopold, in favour of the duke of Hanover, of the house of Brunswick Luneburg. From that period, to the year 1777, the electors

ollege consisted of the three ecclesiastical electors, Mentz, Treves, and Cologne, and the six secular, Bohemia, the palatinate of the Rhine, Saxony, Brandenburg, Bavaria, and Hanover. The dominions of the last elector palatine of the Rhine, having devolved in December 1777 to the elector of Bavaria, the electoral college was again reduced to eight members, until the peace of Luneville; when the three ecclesiastical electorates were secularised, the archbishop of Ratisbon introduced as a new elector arch-chancellor, and the duke of Wirtemberg, the landgrave of Hesse Cassel, the margrave of Baden, and the grand duke of Tuscany, as duke of Saltzburg, raised to the electoral dignity. This increased the number of electors to ten, viz. the elector arch-chancellor, Bohemia, Bavaria, Saxony, Brandenburg, Hanover, Wirtemberg, Hesse Cassel, Baden, and Saltzburg.

This arrangement was finally destroyed, as we have seen (article DIET), in the year 1806, when the German empire was dissolved. Bavaria and Wirtemberg, on joining the Confederation of the Rhine, under the protection of the French empire, assumed the royal dignity; Hanover was in possession of the French; Baden and Saltzburg took the titles of grand dukes; the elector arch-chancellor that of the prince primate of the Confederacy of the Rhine: and the year following Saxony assumed the royal dignity; Hesse Cassel was annexed to the new kingdom of Westphalia; Bohemia as part of the dominions of Austria, and Brandenburg as part of those of Prussia, reverted to these two houses as independent monarchical states. And thus the title of elector, which for so long a series of years conferred a rank equal to that of the old kings of Europe, became finally extinct.

The last electors of the German empire were, 1. Charles Theodore, baron Dahlberg, elector of Ratisbon, and arch chancellor, now prince primate. 2. Frederick William III., king of Prussia, elector of Brandenburg. 3. George III., king of Great Britain, elector of Hanover. 4. Ferdinand Joseph, elector of Saltzburg, now duke of Saltzburg. 5. Frederick II., elector, now king of Wirtemberg. 6. Charles Frederick, elector, now grand duke of Baden. 7. William X., elector of Hesse Cassel, driven from his dominions by the French. 8. Maximilian Joseph, elector, at present king of Bavaria. 9. Frederick Augustus IV., elector, at present king of Saxony; and, 10. Francis II., elector of Bohemia, afterwards emperor of Austria.

The electors besides the power of electing an emperor, had a right to capitulate with the new head of the empire, to dictate the conditions on which he was to reign and to depose him if he broke those conditions. They actually deposed Adolphus of Nassau, in 1298, and Wenceslaus in 1401. They were sovereign and independent princes in their respective dominions, had the 'privilegium de non appellando illimitatum,' that of making war, coining, and exercising every act of sovereignty. They formed a separate college in the diet of the empire, and had among themselves a particular covenant, or league, called the 'Kur verein.' They had precedence of all the other princes of the empire, even of cardinals, and ranked with kings. There was, however, a difference between the secular and ecclesiastical electors; none of the latter could be chosen emperor, and they were to be thirty years of age before they could attain the electoral dignity, whilst the majority of the secular ele[illegible]rs was fixed at eighteen years of age, and an[illegible] them might be placed at the head of the [illegible]e; indeed they might even vote in their ow[illegible]r. The functions of the electors were exercised by deputies. The elector of Mentz was arch-chancellor in Germany; Treves, in Gaul and the kingdom of Arles; Cologne, in Italy; Bohemia was arch-cupbearer; Bavaria, arch-sewer, or officer who serves out the feasts; Saxony, arch-marshal; Brandenburg, arch-chamberlain; Hanover, arch-treasurer. During the vacancy of the imperial throne, the elector of Saxony used to be vicar of the empire in the north, and the elector of Bavaria of the southern circles. On the demise of an emperor of Germany, or a vacancy ensuing in the imperial throne, the electors were summoned by the archbishop of Mentz to meet (generally at Frankfort) within three months. One month was ordinarily allowed for their determination; if it was delayed longer they were, according to the imperial constitution, to be fed on bread and water until they had made a choice. Both their dress and functions are particularly described by Du Cange.

# ELECTRICITY.

ELECTRE, *n. s.*
ELE'CTRIC, *adj.*
ELE'CTRICAL,
ELECTRI'CIAN, *n. s.*
ELECTRI'CITY,
ELE'CTRIFY, *v. a.*
ELE'CTRISE, *v. a.*
ELECTRO'METER, *n. s.*

Gr. ηλεκτρον; Latin, *electrum*, amber, which, having the quality when warmed by friction of attracting bodies, gave to one species of attraction the name of electricity, and to the bodies that so attract the epithet electric; which also means produced by an electric body; and metaphorically, rapid; powerful. Bacon uses electre for a metallic compound. An electrician is he who is skilled in electricity. To electrify, *electrum* and *fio*, to render electric, or apply electricity, and to electrise, are used synonymously. Electrometer, an instrument for ascertaining the presence and portion of electricity in any given body.

Change silver plate or vessel into the compound stuff, being a kind of silver *electre*, and turn the rest into coin. *Bacon.*

If that attraction were not rather *electrical* than magnetical, it was wondrous what Helmont delivereth concerning a glass, wherein the magistery of loadstone was prepared, which retained an attractive quality. *Browne.*

By *electrick* bodies do I conceive not such only as take up light bodies, in which number the ancients only placed jet and amber; but such as, conveniently placed, attract all bodies palpable. *Id.*

An *electrick* body can by friction emit an exhalation so subtile, and yet so potent, as by its emission to cause no sensible diminution of the weight of the *elec-*

*trick* body, and to be expanded through a sphere, whose diameter is above two feet, and yet to be able to carry up lead, copper, or leaf gold, at the distance of above a foot from the *electrick* body. *Newton.*

When I would observe the *electricity* of the atmosphere with this instrument, I thrust the pin I into the cork D, and holding the rod by its lower end A, project it out of a window on the upper part of a house, into the air; raising the end of the rod with the *electrometer*, so as to make an angle of about fifty or sixty degrees with the horizon. *Cavallo.*

Then mark how two *electric* streams conspire
To form the resinous and vitreous fire. *Darwin.*

If a metallic point be fixed on the prime conductor, and the flame of a candle be presented to it, on *electrising* the conductor either with vitreous or resinous ether, the flame of the candle is blown from the point, which must be owing to the *electric* fluid in its passage from the point carrying along with it a stream of atmospheric air. *Id.*

But now a bride and mother—and now there!
How many ties did that stern moment tear!
From thy Sire's to his humblest subject's breast
Is linked the *electrick* chain of that despair,
Whose shock was as an earthquake's, and opprest
Thy land which loved thee so that none could love
thee best. *Byron.*
And the wild sparkle of his eye see[illegible] caught
From high, and lightened with *electri*[illegible]aght.
*Id.*

1. The particular branch of science denominated electricity appears to have derived its name from that of the first substance in which any of its properties were discovered. This was amber, the Greek name of which is ἠλεκτρον, evidently derived from Ἠλεκτωρ, a name by which Homer designates the Sun. It has been said by some that the ancients, observing amber to possess the property of attracting light substances when rubbed, termed it electrum, and that hence arose the word electricity. Those who entertain this opinion, would derive the name from the Greek verb ἑλκω to draw; but this appears to us to be a very forced derivation, since amber was doubtless called by the name of electron, long before it was known to possess the magnetic property of attraction. Perhaps it was so called from its bright and shining appearance. But, whatever may be the etymology of the term, it is now employed to designate that science which investigates the attractions and repulsions, the emissions of light, and explosions, which are produced, not only by the friction of vitreous, resinous, and metallic surfaces, but by the heating, cooling, evaporation, and mutual contact of a vast number of substances.

2. It is rather remarkable that, although the attractive energy of electricity has all the appearance of being a very recent discovery, it has been said to be 'the first physical fact recorded in the history of science.' The electrical properties of amber were known and pointed out upwards of 2000 years ago; but the subject did not engage the attention of the learned till the beginning of the seventeenth century. This was perhaps a fortunate circumstance, since it at all events prevented the science from being clouded or perverted by the ignorance of early times.

3. Dr. William Gilbert, of Colchester, appears to have been the first person who essentially contributed to the establishment of electricity as a science. In the year 1600 he published his work entitled De Magnete, which contains a number of experiments made with various substances, possessing the properties of amber, now termed electrics. Of Dr. Gilbert, Cavallo says that he ought to be considered as the father of electricity.

4. No further discoveries were made in this science of any importance till the year 1670, when the celebrated Mr. Boyle much enlarged the list of electrics, and by experiment discovered that their effects were much increased by warming and wiping them before the application of friction, and that during the friction they emitted faint flashes of light; this appearance he considered as an additional characteristic of the electrical power.

5. Otto Guericke of Magdeburg, the inventor of the air-pump, and a contemporary with Mr. Boyle, confirmed the experiments of the latter, and much enlarged the state of electrical knowledge. He constructed an apparatus in which the electric, a globe of sulphur, was made to revolve on an axis; the hand was applied to it as a rubber; and by this contrivance, which was in principle the same as the most modern construction of the electrical machine, he was enabled to obtain an accumulation of electricity far beyond any thing that had been effected by his predecessors. This philosopher discovered also the principle of electrical repulsion.

6. In the year 1709 appeared the first treatise on electricity; it was the production of Mr. Hawksbee, who far exceeded his predecessors in the discoveries which he made. He was the first who observed the electric power of rubbed glass; the flashing light of an excited electric had been observed by Boyle; but, as Mr. Hawksbee by his glass globe could collect the electric matter in much greater quantities than had been done before, he had the pleasure of beholding the intensity of its light, and of observing the snapping noise by which its discharges are attended. Some of the experiments made by Mr. Hawksbee were very curious, and deserve more notice than has hitherto been taken of them. Among others the following may be mentioned. He lined more than one-half of a glass globe with sealing-wax, and, having exhausted it of its air, he put it in motion in an appropriate frame. On applying his hand to it, for the purpose of excitation, he was surprised to observe an exact image of his hand on the concave surface of the wax, as distinctly defined as if there had been nothing but transparent glass between his eye and his hand, although the wax was in some places an eighth of an inch in thickness. When pitch was used instead of wax the effect was the same.

7. After this period the science of electricity appears to have been for some time stationary, from the discoveries of Sir Isaac Newton absorbing the attention of the public; but, soon after the death of that distinguished individual, it obtained renewed attention, and some very important discoveries were made in it by Mr.

.ephen Grey, a pensioner of the Charter-house. Vith the date of this gentleman's experiments ommenced the modern triumph of electricity. Directing his attention to the nature of electrical henomena, he endeavoured to excite them in ll known bodies; and, though in many cases he vas unsuccessful, he thus added considerably to he catalogue of electrics. Many substances, in vhich no attractive power was excited by rubing while in their natural state, became strongly ttractive if excited after being moderately varmed, but lost this property as they became old. This fact, says the late ingenious Mr. inger, clearly pointed out a relation between ie state of bodies and their power of evincing lectric appearances; and the nature of this reition was explained by Mr. Grey's subsequent xperiments. Every attempt to render metals lectric by friction or otherwise proved inefectual in the hands of Mr. Grey, as well as in iose of his predecessors, when it occurred to im that, as electric light appeared to pass beveen excited bodies and such as were incapable f excitation, the attractive power might be also apable of communication from one to the ther.

8. For this purpose Mr. Grey inserted a wire nd ball, by means of a piece of cork, in the xtremity of a glass tube, and, on rubbing the ibe, found its attractive power was communiated to the wire and ball. He proceeded with iis experiment until the length of the wires vhich he used became inconvenient. He then uspended the ball by means of pack-thread, from ie tube, and found the electricity was still comiunicated. The same result was obtained when ie ball was suspended by the pack-thread, from balcony twenty-six feet high: on exciting the ibe small light substances were attracted by the all from the pavement of the court below.

9. In connexion with Mr. Wheeler, Mr. Grey fterwards extended his experiments, and suceeded in transmitting the electric power from is excited tube through nearly 800 feet of packhread, without any apparent diminution of its force. In arranging the apparatus for these experiments these gentlemen found that a silken cord was incapable of transmitting the attractive power of the tube; an effect which they at first attributed to its comparative smallness, but they afterwards observed that a wire of much smaller diameter carried off the electrical effect completely, and thus discovered that there are in nature various bodies differently qualified for the transmission of the electric matter, some conveying it most readily, and to a great distance, and others incapable of transmitting it to any perceptible distance. The former class of bodies are now termed conductors of electricity, and the second class non-conductors, or electrics; these terms are said to have been first applied to them by Desaguliers.

10. Soon after Mr. Grey's discovery of the difference between conductors and non-conductors, M. Du Fay discovered the difference between positive and negative, or, as they were for some time, and are still by some called, the vitreous and resinous electricities. This discovery was accidentally made in consequence of his observing, that a piece of leaf-gold, repelled by an excited glass tube, and which he endeavoured to drive about the room with a piece of excited gum copal, instead of being repelled by it, as it was by the glass tube, was eagerly attracted. The same was the case with sealing wax, sulphur, resin, and many other substances. He discovered, also, that it was impossible to excite a tube in which the air was condensed. He also observed, that such substances as were least susceptible of electric excitement by friction were the best conductors of electricity; though all the bodies he tried became electric by communication when placed on a non-conducting support. In this way he electrified himself, being supported by silk lines, and touched by an excited glass tube; and on this occasion the abbe Nollet, who accompanied him in these experiments, drew the first electrical spark from the human body.

11. M. Du Fay, says Mr. Singer, has also the merit of having given the first clear account of that apparent repulsion which obtains in most electric experiments, and which was first observed by Otto Guericke, who had noticed that the fibres of an electrified feather receded from each other and from the tube or globe by which they h[illegible] n electrified. Du Fay viewed this as the [illegible]on of a general principle in electricity, wh[illegible] nay be thus expressed. Electrified bodies attract all those that are not so, but repel them as soon as they are electrified by their contact.

12. The consideration of this general principle led the same assiduous philosopher to a discovery f the first importance, viz. the existence of two distinct attractive powers, produced by the friction of different substances, the one excited by rubbing glass, rock crystal, gems, wool, hair, and many other substances, he called vitreous electricity. The other, resulting from the friction of amber, copal, gum-lac, resins, sealing-wax, &c., he named resinous electricity. The characteristics of these attractive powers are, that they strongly attract each other, and produce a mutual counteraction of effect, whilst they separately act in an apparently similar manner on all unelectrified bodies: but the effect of either of them is destroyed or weakened by the approach of the other. If gold leaf be electrified by rubbed glass it immediately recedes from it, and will not again approach whilst it remains in its electric state. But in this state it is strongly attracted by any excited body of the resinous class, and will fly to sealing-wax or amber more rapidly than to an unelectrified body. Hence it was concluded, by Du Fay, that there are two distinct electricities, each repulsive of its own particles, but having a strong attraction for those of the other. So that all bodies electrified with the vitreous electricity repel those that are similarly electrified, and attract such as are unelectrified or endowed with the resinous electricity. And the converse of this is the case with such as are possessed of the resinous electricity.

12.* The terms resinous and vitreous electricity, continues the same author, were sufficiently appropriate at the time they were proposed; but it has been since found that either kind of elec-

tricity can be obtained at pleasure, both from glass and sealing-wax, by varying the nature of the substance with which they are rubbed. Hence the vitreous electricity of Du Fay is now called positive electricity; and the resinous, negative electricity; terms first proposed by Dr. Franklin.

13. To the labors of Messrs. Grey and Wheeler, and their coadjutors Du Fay and Nollet, all subsequent electricians are highly indebted; their means of research were extended by the improvement of electrical apparatus, necessarily resulting from the discovery of conducting and non-conducting power; whilst the generalisation of electric phenomena by Du Fay, and his discovery of the distinction between positive and negative electricity, was an enlargement of the existing sphere of knowledge in a degree before unparalleled. From this period, indeed, the science assumed a more important aspect, its cultivators increased in number, and the communication of their researches constituted a prominent feature in the transactions of the most celebrated societies and academies of Europe.

14. It was in the year 1745 that the remarkable properties of the Leyden phial were first observed. This discovery was merely accidental; yet it tended, more than any other discovery hitherto made, to promote the progress of electricity. The circumstances that led to this discovery were the following:—Professor Muschenbroeck observed, that when conducting bodies were placed on glass, &c., and electrified, their electricity was very soon carried off by the conducting particles floating in the atmosphere; he therefore imagined, if a conducting substance were put into a glass phial, that it could be charged much higher than in open air, as the glass would protect it from the dissipating action of the atmosphere.

15. This idea he attempted to put in practice by filling a small phial with water, which is a conducting substance. For this purpose he passed the end of a wire through the cork of the phial, so as to touch the water, and then charged the water by bringing the wire in contact with the prime conductor, but found no extraordinary result from the experiment. Mr. Cuneus, of Leyden, who was one of the party when the professor made the experiment, repeated it afterwards; and, happening to hold the phial in his hand, after he had connected the wire with the prime conductor, until the water, as he supposed, had received a full charge of electricity, and then applying his other hand to unloose the wire from the conductor, he received such a sudden shock in his arms and breast, as filled him with astonishment.

16. The report of such a strong effect of the electric power immediately raised the attention of all the philosophers in Europe. Many of them greatly exaggerated their accounts; either from a natural timidity, or a love of the marvellous. M. Muschenbroeck, who tried the experiment with a very thin glass bowl, told M. Reaumur in a letter written soon after the experiment, that he felt himself struck in his arms, shoulder, and breast, so that he lost his breath; and was two days before he recovered from the effects of the blow, and the terror. He added, that he would not take a second shock for the whole kingdom of France. Mr. Allamand, who made the experiment with a common beer glass, said, that he lost his breath for some moments; and then felt such an intense pain all along his right arm, that he was apprehensive of bad consequences, but it soon after went off without any inconvenience, &c. Other philosophers, on the contrary, showed their magnanimity, by receiving a number of electric shocks as strong as they could possibly make them. Mr. Boze wished that he might die by the electric shock, in order to furnish, by his death, an article for the memoirs of the Academy of Sciences at Paris. But, adds Dr. Priestley, in his history of electricity, it is not given to every electrician to die in so glorious a manner, as the justly envied Richman. Public curiosity was promptly and highly excited by this discovery, and all Europe was presently filled with itinerant exhibitors of the Leyden Jar, who obtained a livelihood by administering the electrical shock. The experiment was repeated and varied by the electricians of every country, and an explanation of the principle on which the effect depends, was offered by Dr. Franklin of America, and Dr. Watson in England, at the same time, without the one knowing that the other was engaged in the pursuit. The propositions of these two philosophers, observes Mr. Singer, were nearly similar; but that of Dr. Franklin being the more perfect, and having a real priority of publication, was adopted, and has been since celebrated as the Franklinean Theory of Electricity. He referred all electrical effects to the motion of a peculiar fluid, repulsive of its own particles, and having an attraction for all other matter. And he considered the opposite electricities of glass and sealing-wax as indications of different states of this fluid: the vitreous electricity being the plus or positive state, and the resinous the minus or negative state. All bodies can contain a certain quantity of electric fluid in a latent state. If this quantity be increased they become electrified positively; if it be diminished they are rendered negative. The production of electrical effects is therefore nothing but the result of the unequal distribution, by art, of a naturally diffused fluid. Such are the leading principles of the Franklinean theory; they have been considered mathematically by Mr. Cavendish, by Æpinus, and others, and, with some modifications, apply to most of the electrical phenomena at present known.

17. Frequent experiments, attended with close observation, were likely enough to lead to important results in this interesting science; and we have now arrived at a period in its history which is perhaps the most distinguished of any. We allude to the discovery of the identity of electricity and lightning. Mr. Grey and Dr. Wall seem to have been the first who thought of the resemblance between thunder and the snapping noise which is heard when an excited electric is approached by a conducting substance. The abbé Nollet, Mr. Winckler, and others, also enumerated many resemblances between the phenomena of electricity and those of thunder;

but they did not think of any method by which their suppositions could be brought to the test of experiment. The remarks of the abbé Nollet on this subject, considering the time at which they were made, are so striking, that we consider them well deserving of a place in the memory of every lover of the electrical science, and shall here record them.

18. 'If,' says he, 'any one should take upon him to prove from a well connected comparison of phenomena, that thunder is in the hands of nature what electricity is in ours; that the wonders which we now exhibit at our pleasure, are little imitations of those great effects that frighten us, and that the whole depends upon the same mechanism: if it can be demonstrated that a cloud prepared by the action of the winds, by heat, by a mixture of exhalations, &c., is opposite to a terrestrial object; that this is the electrified body, and at a certain proximity to that which is not; I avow that this idea, if it were well supported, would give me a great deal of pleasure; and, in support of it, how many specious reasons present themselves to a man who is well acquainted with electricity! The universality of the electric matter, the readiness of its action, its inflammability, and its activity in giving fire to other bodies, its property of striking externally and internally even to their smallest parts, the remarkable example we have of this effect in the Leyden experiment, the idea which we might truly adopt in supposing a greater degree of electric power, &c.; all these points of analogy, which I have been some time meditating, begin to make me believe, that, by taking electricity for the model, one might form to one's self, in respect to thunder and lightning, more perfect and more probable ideas than have hitherto been offered.'

19. It is generally admitted that the French philosophers were the first to verify these conjectures: they preceded the justly celebrated Dr. Franklin in drawing the electric matter from the clouds by means of an iron conducting rod; but, within a month after they had done so, the American philosopher effected the same thing in a manner that never seems to have entered into their minds. Speaking of the observations of the abbé Nollet, above quoted, Mr. Singer justly remarks, that thy bear no comparison with the acute conception, sound philosophical argument, and satisfactory experiments, by which Dr. Franklin has demonstrated the identity of the electric fluid, and the cause of thunder. Dr. Franklin, says he, had observed with equal attention the peculiarities of the natural phenomenon, and the power to which he ascribed its production; he enumerated the following as their leading features of resemblance.—

(1.) The zigzag form of lightning corresponds exactly in appearance with an electric spark that passes through a considerable interval of air.

(2.) Lightning most frequently strikes such objects as are high and prominent, in preference to others, as the summits of hills, the masts of ships, high trees, towers, spires, &c. The electric fluid, when striking from one body to another, always passes through the most prominent parts.

(3.) Lightning is observed to strike most frequently into those substances that are good conductors of electricity, such as metals, water, and moist substances; and to avoid those that are non-conductors.

(4.) Lightnings inflame combustible bodies. The same is effected by electricity.

(5.) Metals are melted by a powerful charge of electricity. This phenomenon is one of the most common effects of a stroke of lightning.

(6.) The same may be observed of the fracture of brittle bodies, and of other expansive effects common to both causes.

(7.) Lightning has often been known to strike people blind. Dr. Franklin found, that the same effect is produced on animals when they are subject to a strong electric charge.

(8.) Lightning destroys animal life. Dr. Franklin killed turkies of about ten pounds weight, by a powerful electric shock.

(9.) The magnetic needle is affected in the same manner by lightning and by electricity, and iron may be rendered magnetic by both causes. The phenomena are therefore strictly analogous, and differ only in degree; but if an electrified gun-barrel will give a spark, and produce a [illegible]d report at two inches distance, what effect [illegible] not be expected from perhaps 10,000 acres [illegible]trified cloud? And is not the different e[illegible] of these conductors, equal to the different [illegible]mit of their effects? But to ascertain the accuracy of these ideas, let us have recourse to experiment.

Pointed bodies receive and transmit electricity with facility; let, therefore, a pointed metal rod be elevated in the atmosphere, and insulated; if lightning is caused by the electricity of the clouds, such an insulated rod will be electrified whenever a cloud passes over it, and this electricity may then be compared with that obtained in our experiments. Such were the suggestions of this admirable philosopher: they soon excited the attention of the electricians of Europe, and having attracted the notice of the king of France, the approbation he expressed excited in several members of the French Academy a desire to perform the experiment proposed by Franklin, and several insulated and pointed metallic rods were erected for that purpose.

20. In this pursuit the most active persons were two French gentlemen, Messrs. D'Alibard and Delar. The former prepared his apparatus at Marly la Ville, five or six leagues from Paris; the latter at his own house, on some of the highest ground in that capital. M. D'Alibard's machine consisted of an iron rod forty feet long, the lower extremity of which was brought into a sentry-box, where the rain could not come; while on the outside it was fastened to three wooden posts by long silken strings defended from the rain. This machine was the first that was favored with a visit of the etherial fire. M. D'Alibard himself was not at home; but, in his absence, he had entrusted the care of his apparatus to one Coissier, a joiner, who had served fourteen years in the army, and on whose courage and understanding he could depend. This artisan had all the necessary instructions given him; and was desired to call some of his

neighbours, particularly the curate of the parish, whenever there should be any appearance of a thunder storm. At length the long expected event arrived. On Wednesday, 10th May, 1752, between two and three P. M. Coissier heard a pretty loud clap of thunder. Immediately he ran to the machine, taking with him a phial furnished with a brass wire; and presenting the wire to the end of the rod, a small spark issued from it with a snap like that which attends a spark from an electrified conductor. Stronger sparks were afterwards drawn in the presence of the curate and a number of other people. The curate's account of them was, that they were of a blue color, an inch and a half in length, and smelled strongly of sulphur. In making them, he received a stroke on his arm a little below the elbow; but he could not tell whether it came from the brass wire inserted into the phial, or from the bar. He did not attend to it at the time; but the pain continuing, he uncovered his arm when he went home in the presence of Coissier. A mark was perceived round it, such as might have been made by a blow with the wire on his naked skin.

21. Dr. Franklin himself had an opportunity, about a month after this, of verifying his own hypothesis. He was waiting for the erection of a spire in Philadelphia, not imagining that a pointed rod of a moderate height could answer the purpose. At last it occurred to him, that by means of a common kite he could have a readier access to the higher regions of the atmosphere than any other way whatever. Preparing, therefore, a large silk handkerchief and two cross sticks of a proper length on which to extend it, he took the opportunity of the first approaching thunder-storm to take a walk into a field where there was a shed convenient for his purpose. But, dreading the ridicule which too commonly attends unsuccessful attempts in science, he communicated his intention to nobody but his son, who assisted him in raising the kite. A considerable time elapsed before there was any appearance of success. One very promising cloud had passed over the kite without any effect; when, just as he was beginning to despair, he observed some loose threads of the hempen string to stand erect and avoid one another, just as if they had been suspended by the conductor of a common electrical machine. On this he presented his knuckle to a key which was fastened to the string, and thus obtained a very evident electric spark. Others succeeded even before the string was wet; but, when the rain had begun to descend, he collected electric fire pretty copiously. He had afterwards an insulated iron rod to draw the lightning into his house; and performed almost every experiment with real lightning, that had before been done with the artificial representations of it by electrical machines. With this apparatus he connected two small bells and a pendulum between them, which were so arranged as to ring when electrified, and thus to give notice of the approach of a thunder-cloud.

22. Experiments with the electrical kite were repeated in all directions, and with various success; in France a most brilliant display of its powers was made by M. de Romas. He constructed a kite of seven feet in height, and three feet wide; this kite he raised to the height of 550 feet by a string, in which was interwoven a fine metallic wire to render it a good conductor. On the 7th of June, 1753, when this kite was elevated, M. de Romas informs us that he drew from the conductor to which the string was attached sparks three inches long, and a quarter of an inch thick. On one or two occasions he met with increasing success, and was enabled to draw sparks, or rather streams, of the electric matter from his apparatus, of a foot in length, and an inch in thickness. But on the 16th of August, 1757, M. de Romas, with an additional length of string to his kite, was still more successful. The storm at the time was not great, neither was there much thunder, and but little rain had fallen; yet streams of lightning, nine or ten feet long, and an inch in thickness, darted from his conductor to the ground, accompanied with a noise equal to that attending the discharge of a pistol.

23. It was not to be expected that, in the infancy of the science, experiments on such a scale should be always conducted with safety: accidents will happen in the management of the best constructed apparatus, and the first operators on atmospherical electricity received many severe and unexpected shocks. Numerous, however, and dangerous as these accidents have been, there is only one instance known of their having proved fatal; to that we have already alluded, and shall here state some of the leading particulars attending the melancholy catastrophe. Professor Richman, of St. Petersburgh, had constructed an apparatus for making experiments on atmospherical electricity, for a work on that subject in which he was engaged. On the morning of the day that terminated his mortal career he was attending a meeting of the Academy of Sciences, and, hearing the sound of distant thunder, he hastened home to observe his apparatus, and took with him Mr. Solokow, his engraver, that he might make any sketch required during the action of the apparatus. On inspecting his electrometer, he found it indicated 4° on the quadrant; and, while pointing out to his friend the danger to be apprehended should it rise to 45°, a loud peal of thunder burst over the city. At this moment the professor inclined his head towards the apparatus to observe the height to which the electrometer had risen, and while in this posture, with his hand about a foot from the conducting rod, a ball of fire, of a bluish-white color, flashed from the rod to his head, with a report equal to that of a pistol. Richman fell backwards on a chest behind him, and expired in a moment. Solokow was much stunned by the discharge; and described the ball of electric fire as being about the size of his closed hand. The wires of the apparatus were melted and scattered about the room; the door was torn from its hinges and thrown upon the floor; the house was filled with sulphureous vapor, the ashes were thrown from the fire-place, and the door-posts rent asunder.

24. A vein was opened in the professor's body twice, but no blood followed; after which, they

endeavoured to recover life by violent friction, but in vain. There appeared a red spot on the forehead, from which spirted some drops of blood through the pores, without wounding the skin. The shoe belonging to the left foot was burst open, and uncovering the foot at that part, they found a blue mark; whence it was concluded, that the electric matter having entered at the head, made its way out again at that foot. Upon the body, particularly on the left side, were several red and blue spots resembling leather shrunk by being burnt. Many more also became visible over the whole body, and particularly over the back. That upon the forehead changed to a brownish red, but the hair of the head was not singed. In the place where the shoe was burst, the stocking was entire; as was the coat every where, the waistcoat only being singed on the fore flap: but there appeared on the back of Mr. Solokow's coat long narrow streaks, which probably arose from fragments of the red hot wires falling on it and burning off the nap. Next day, when the body was opened, the cranium was very entire, having neither fissure nor contra-fissure: the brain was sound; but the transparent pellicles of the wind-pipe were excessively tender, and easily rent. There was some extravasated blood in it, as also in the cavities below the lungs. Those of the breast were quite sound; but those towards the back of a brownish black color, and filled with more of the blood above-mentioned. The throat, the glands, and the small intestines, were all inflamed. The singed leather-colored spots penetrated the skin only. In forty-eight hours the body was so much corrupted that they could with difficulty place it in the coffin. It is said that, at the time of his death, professor Richman had in his pocket seventy rubles of silver, which were not in the least affected by the lightning.

25. There was no longer any doubt remaining as to the identity of lightning, and the electricity produced by the electrical machine; and the great practical use made of this discocovery was to secure buildings, ships, &c., from being damaged by lightning, by erecting on them pointed metallic rods, rising a little above the highest part of the building, and passing along it so as to communicate with the ground or the nearest water, a full account of which will be given in the course of this essay.

26. A short time previous to the event of professor Richman's death, a most remarkable attempt was made by a gentleman in Italy, to gain on the credulity of his countrymen and others, by pretending that if odoriferous substances were enclosed in glass tubes, and the tubes excited, the medicinal virtues of those substances would transpire through the glass, impregnate the atmosphere of the conductor, and thus be readily communicated to the patient without being taken into the stomach. The most astonishing cures were said to have been performed by these medicated tubes; and the inventor, J. Francisco Pivati, published an account of them to the world. Both the British and French philosophers united in investigating the merits of Pivati's experiments, and the result was a complete failure, in every instance in which the experiments were repeated, though this was done in the presence of those who pretended to have been so successful; and, in some cases, with the very apparatus they themselves had used. The theory was, consequently, no longer credited.

27. To enumerate, in chronological order, all the discoveries that have been made in the science of electricity, from the invention of the Leyden phial to the present period, would swell this introductory sketch far beyond its proper limits; and yet, as having so eminently contributed towards raising the science to its present elegant, improved, and highly prosperous state, there are several whose names it would be injustice to pass by in silence. As the chief of these we may notice the following: Mr. Canton, an eminent English electrician, who distinguished himself by a very successful repetition of Dr. Franklin's experiments on atmospherical electricity; a method of electrifying the air of a room, either positively or negatively; and particularly by disproving the correctness of the theory of vitreous and resinous electricity, and showing that every electric is capable of giving it both in a positive and negative form, according to the nature of the surface of the body, and the kind of rubber with which it is excited.

This ingenious electrician made several remarkable experiments on electrical atmospheres, which led to the establishment of the fact, that bodies immersed in them became possessed of the electricity the opposite of that of the body into the atmosphere of which they are placed.

28. In connexion with the name of Canton must be mentioned that of Beccaria, author of a work entitled Dell' Elettricismo Artificiale e Naturale, and which was translated into English in the year 1776. The discoveries of Signor Beccaria were nearly the same as those of his contemporary, Mr. Canton, although they had had no communication with each other on the subject. Beccaria also made some very important experiments on the conducting power of water; in these he ascertained, that water is a very imperfect conductor of electricity; that it conducts it according to its quantity, and that, when used in very small quantities, its resistance was greatest. See Beccaria.

29. Some interesting discoveries were made in the year 1759, on the electrical qualities of silk, by Mr. Symner. An account of these he published in the Philosophical Transactions. His attention seems to have been directed to the subject by accidentally observing, that, on pulling off his silk stockings in the evening, a crackling noise proceeded from them, and that in the dark they emitted sparks of fire. He found that these electrical appearances were always the strongest when a silk and worsted stocking were both on one leg, and that it was of no consequence which of them was next the skin, but that they must be of different colors, one white and the other black. Two stockings of this description, worn on the leg for the short space of ten minutes, on being pulled off, stood inflated as if the leg had been within them, and, on being drawn asunder, attracted each other at

the distance of eighteen inches. These effects are always most powerful when the stockings are new, or when newly washed. Those who choose to try this very simple experiment will find it succeed equally well if the stockings are placed one within the other, drawn a few times through the hand, and then quickly pulled asunder.

30. Mr. Kinnersly, an intimate friend of Dr. Franklin, made several experiments that contributed to the advancement of electricity. These related chiefly to the discovery of the two electricities, the conducting power of water at different temperatures, and the power of strong charges of electricity when passed through brass wires. In the first of these experiments he had been anticipated by M. Du Fay; but he soon perceived that Du Fay did not consider the two electricities in the same light as that in which they were viewed by Franklin, viz. positive and negative.

31. In 1757 a work appeared on electricity, entitled Disputatio Physica Experimentalis de Electricitatibus, by Mr. Wilke, of Rostock, in Lower Saxony, in which the author gives some very interesting details of his researches respecting the electricity developed during the melting and cooling of electrical substances; and also that produced by the friction of different bodies. This gentleman found that, when sulphur is melted in an earthen vessel placed on non-conductors of electricity, it is strongly electrified when taken out after it is cold; but that it shows no signs of electricity if cooled upon electrics. Melted sealing-wax, he found, acquired negative electricity when poured into glass vessels, but positive electricity when poured into sulphur. Mr. Wilke also confirmed the experiments of Dr. Franklin and Mr. Canton on electrical atmospheres, and illustrated the phenomena of electrical light.

32. M. Alpinus, a member of the Imperial Academy at St. Petersburgh, seems to have been the first who gave to the world a mathematical demonstration of the theory of electricity. An exposition of his treatise was published by the abbé Hauy; and an excellent paper, on the same subject, was drawn up for the Royal Society by Mr. Cavendish, before he knew any thing of the theory of M. Alpinus. The merits of M. Alpinus are certainly great, but we consider Cavendish as having much higher claims as an electrician; his experiments on the conducting power of water and wire; his very ingenious construction of the artificial torpedo; and above all, his success in employing electricity as a chemical agent, justify this opinion.

33. The labors of Dr. Priestley, as an electrician, are deservedly held in the highest esteem; the doctor brought no common share of ingenuity and perseverance to bear upon the science; and to him we are indebted for a considerable number of important improvements and interesting experiments in electricity, as connected with chemistry; for a most excellent treatise on the History of Electricity; an Introduction to Electricity; several valuable papers on the same subject, inserted in the Philosophical Transactions; and for numerous improvements in the construction of electrical apparatus.

34. The theories of Alpinus and Cavendish were much improved on by the ingenuity of M. Coulomb. By those philosophers the action of the electric matter, in producing attraction or repulsion, was considered merely as diminishing with the distance; but by the experiments of Coulomb it was proved that the electrical force, like that of gravity, is in the inverse ratio of the squares of the distance. The instrument with which Coulomb made his experiments was of his own construction: he gave it the name of the 'torsion balance,' from the manner of its action; a description of it will be given in the course of this essay. Coulomb also made numerous experiments for the purpose of ascertaining the laws by which the dissipation of the electrical matter in the air is regulated; and also to ascertain the distribution of it in an overcharged body. In prosecuting these enquiries he was certainly as successful as could possibly be expected, considering the extreme delicacy of his apparatus, and the effects which the variableness of the atmosphere produces on the strongest electrical experiments.

35. To M. De Saussure we are also indebted for some remarkably fine experiments, which seem to have been made with great care, on the electricity developed during the conversion of fluids into vapor. The fluids on which he operated were distilled water, spirit of wine, and ether. The same philosopher likewise made some highly interesting experiments on atmospherical electricity, for the verification of which he made a journey to the Alps.

36. Most of those who have devoted their attention to the study of electricity, as a science, have distinguished themselves by the invention of some new instrument, the use of which has generally led to some important discovery.

This was peculiarly the case with Sig. Volta, professor of natural philosophy at Como in Italy. He invented the electrophorus, an ingeniously constructed instrument for collecting and retaining the electric matter; and another called a condenser, the use of which is to accumulate, and render visible, the smallest portions of electricity, natural or artificial. The celebrity of Volta, however, rests chiefly on the important improvements which he made in that branch of electricity designated GALVANISM, under which they will be fully considered.

37. We have already noticed the scientific experiments of Coulomb, and must here observe that Dr. Robison, late professor of natural philosophy in the university of Edinburgh, is justly entitled to a share of the honor bestowed on Coulomb, since he had, so early as the year 1769, made numerous and remarkably successful attempts, with an admirable electrometer of his own invention, to determine the laws of electric action. But the professor did not publish an account of his experiments at the time they were made, which certainly gives them the appearance of posteriority. The conclusion to which Dr. Robison's experiments led him was, that the force of electrical attraction and repulsion is nearly in the inverse ratio of the square of the distance. 'The specific result,' says Dr. Brewster, 'which he obtained was, that the mutual repulsion of

two spheres, electrified in the same manner, varied as $\frac{1}{d^{2}.06}$, $d$ representing the distance of their centres'

38. As electricity now began to be more generally cultivated, it was to be expected that great improvements in the construction of apparatus would take place. This was the case; and the brilliant success of Van Marum of Haarlem, in experiments which had failed in the hands of others, was obviously owing to the prodigious power of the large apparatus constructed by Mr. Cuthbertson of London, and placed in Tyler's museum at Haarlem. Some notice of these experiments will be taken in the course of this article; at present it may be sufficient to state, that, whatever other philosophical instrument makers may have conceived, Mr. Cuthbertson has brought forth the most useful, because the most powerful, electrical apparatus with which we are yet acquainted.

39. Mr. Cavallo is justly entitled to respectful notice in every historical sketch of the rise and progress of the electrical science, to which he made many important additions. This philosopher made numerous experiments on atmospherical electricity; and also added to our stock of electrical apparatus, by his invention of the most ingeniously constructed instruments for measuring, doubling, condensing, and multiplying electricity.

40. There are other philosophers who have liberally contributed to the progressive improvement of this branch of natural [illegible] on whose merits we cannot here dwell; [illegible] this we the less regret as their im[illegible] and discoveries must be still fresh in [illegible] of those who feel an interest in the [illegible] Among these we would simply enumera[illegible] genious and laborious Nicholson, the [illegible] M. Hauy, Mr. Brooks, Mr. Bennet, M[illegible] Mr. Morgan, La Place, and the truly [illegible] annalist M. Poisson.

40.* Many other names of deserved [illegible] might be here mentioned, as having [illegible] labored in raising electricity to its [illegible] nent station among the sciences; b[illegible] bring this part of our article to a co[illegible] acknowledging our obligations to th[illegible] mating that we shall occasionally a[illegible] of their labors. This remark is mea[illegible] particularly to the excellent treatise on [illegible] by the late Mr. George John Singer, a [illegible] lecturer on this science. Mr. Singer's [illegible] stands high in the scientific world; and [illegible] petent judges have pronounced his Elemen[illegible] Electricity and Electro-Chemistry one of the best and most original works on the subject in the English language.

## PART I.

### ON THE PHENOMENA OF EXCITED ELECTRICITY.

41. The more simple methods of exciting electrics enable us to perform several pleasing and instructive experiments without the aid of costly and complex apparatus; the principal of these we now proceed to describe.

If two silk ribands, the one black and the other white, about two or three feet in length, and perfectly dry, be applied to each other by their surfaces, and then drawn smartly a few times between the finger and thumb, or over dry silk velvet or woollen cloth, they will be found to adhere to each other with considerable force; and when separated at one end will rush together again with rapidity. Each riband, when separated, will attract any light substances to which it is presented; and, if the experiment be made in a dark room, a flash of light will occasionally attend the separation of the ribands.

42. Sticks of sealing-wax, resin, or sulphur, when rubbed with dry woollen cloth, or fur; and tubes or rods of glass, when rubbed with silk, exhibit similar powers; and, if of sufficient size, produce, when applied within a short distance of the face or hand, a distinct and singular sensation. These effects having been first produced by the friction of amber (electron) are called electrical phenomena; and the processes employed for their production, the excitation of electricity.

43. Attraction is the phenomenon most constantly attendant on excitation; it is therefore considered as an indication of the presence and action of electricity, and is the basis of all its tests. Electricians formerly, says Mr. Singer, employed for such trials a light wooden or metal needle, supported by its centre on a point, or a thread or feather delicately suspended. To these the excited body was presented, and, if they were attracted by it, the attraction was attributed to electricity, and the excited body was called an electric.

44. This suspended needle, and every other contrivance for the same purpose, they called an electroscope, when employed to indicate the existence of electricity; and an electrometer when considered as a measure of its force; but the latter term appears fully sufficient, since every contrivance hitherto employed to ascertain the presence of electrical phenomena is also calcu[illegible] measure their power. The most useful [illegible] for common purposes, are con[illegible] [illegible]pending two narrow sli[illegible] [illegible] of a glass cylind[illegible] [illegible]d they will [illegible] [illegible]ence [illegible] [illegible] cause [illegible] [illegible] the cylinder. [illegible] from the [illegible] threads [illegible] [illegible] for the [illegible] strips. [illegible] [illegible], but they are more [illegible] [illegible], suspended by threads or [illegible] without a glass [illegible] and other electrometers will [illegible]r.

45. [illegible] are [illegible] characterised by the [illegible] of light substances; the consequent [illegible] of motion in them, and of sensation [illegible] by the evolution or produ[illegible]. There are various methods by wh[illegible] may be produced, but the following [illegible] most obvious sources of their production. (1.) Friction. (2.) Change of form. (3.) Change of temperature. (4.) Contact of dissimilar bodies.

46. Of the first kind, viz. friction, the instances are most numerous, and, as Mr. Singer remarks, under certain limitations, universal; they may indeed be obtained by rubbing any of an extensive list of resinous and silicious substances; and of dry, vegetable, animal, and mineral productions. The electricity thus excited, is most readily rendered visible by its effects on the gold leaf electrometer.

47. Examples of the second kind are also very numerous. If a small quantity of sulphur be melted and poured into a conical wine glass, it will contract a little, and become electrical in cooling. A silk thread with a small hook at the end of it, or a rod of glass should be inserted in the sulphur while in a fluid state, to serve as a handle for separating it from the glass when cold. On being separated from the glass, the sulphur will exhibit other signs of electricity; if kept in the glass it will retain its electric virtue for years, and evince it very perceptibly on every attempt to separate the two substances.

48. Mr. Henly discovered that chocolate, fresh from the mill, becomes strongly electrical, as it cools in the tin pans. It soon loses this property, but recovers it once or twice, by being melted in an iron ladle and poured into the tin pans. When the mass becomes dry, the electricity cannot be restored by melting, unless olive oil be mixed with it in the ladle; in which case it completely recovers its electric power. M. Chaptal observed the same circumstance during the congelation of glacial phosphoric acid. Calomel also, when it fixes by sublimation to the upper part of a glass vessel, has been found strongly electrical. The condensation of vapor, and the evaporation of fluids, though apparently opposite processes, are alike sources of electrical excitation.

49. Various crystallised gems, and a stone called the Tourmalin, become electrical by the mere application of heat; but no other substances have yet unequivocally manifested the same property; though the effects of friction are generally increased, if it is preceded by a moderate elevation of temperature.

50. The contact of dissimilar bodies is probably in all cases the real primary cause of electrical excitement, but it is rarely employed alone, for electricity is known to us only by its effects, which are constantly the result of an artificial arrangement, and consequently may not immediately succeed the primary cause of electric powers, similar in their separate action on the electrometer, and other indifferent matter; but exerting a mutual influence on each other, destructive of their individual properties.

51. It was at first supposed that these phenomena were peculiar to the substances by which they were produced; hence the power excited by the friction of glass was termed vitreous electricity; and that by the friction of sealing-wax, resinous electricity. It has, however, long since been proved that both powers are produced in every case of electrical excitation; and, because their mutual counteraction of effect resembles that of an affirmative and negative power, they have been styled positive and negative electricity.

52. The determination of these two states of electricity in different excited bodies, continues Mr. Singer, is of importance to the practical electrician, and may be thus effected:—Sealing-wax when rubbed on woollen cloth is negatively electrified. Glass, when rubbed with silk is positively electrified. Let an electrometer be made to diverge by its being approached by an excited stick of sealing-wax: while in this state, approach it with any excited body, the electricity of which is to be determined. If the divergence of the electrometer increase, the presented body is negative; if it be diminished, the presented body is positive. In other words, all those substances that lessen the divergence occasioned by excited wax, are positive; and such as increase it, negative: whilst those which lessen the divergence produced by excited glass, are negative; and such as increase it positive. Examining, by this test, the effects produced in some of the instances of excitation already considered, we find the truth of the preceding statements, and the relation of the different electrical states to the processes by which they are produced, become more intelligible. Care ought to be taken to destroy the divergence of the electrometer after every experiment of this nature; this is best effected by touching its cap with one end of a piece of brass wire.

53. As an illustration of the doctrine here advanced let the following simple and easily performed experiments be made.

(1.) Roll up a warm and dry piece of flannel, so that it may be held by one extremity, while a stick of sealing-wax is rubbed with the other. After a slight friction present the flannel to an electrometer, which will instantly diverge; while this divergence continues, bring the stick of sealing-wax near the cap, and the leaves of the electrometer will quickly collapse. Both these substances, it is obvious, are electrified by mutual friction, but their electricities are opposite; that of the wax being negative, and that of the flannel positive.

(2.) The electricities thus produced are equal to each other: for if the friction be repeated, and the two substances be both presented to the electrometer at the same time, no signs of electricity appear: the opposite electricities, when applied together, producing a reciprocal counteraction of effect.

(3.) If a black and a white silk riband be excited in contact, in the manner already described, the black riband will be found to be negatively, and the white one positively electrified.

(4.) Take the sulphur cone described at 47, apply it and the glass separately to the electrometer; the cone will be found to be negatively and the glass positively electrified.

54. From the above experiments it appears, that in all cases of excitation positive and negative electricity are produced at the same time, and may be observed by the use of proper means. But it also appears that by friction with the same substance, different bodies are variously affected; for glass rubbed with silk evinces positive electricity: but wax rubbed with silk is rendered negative. Again, polished glass, when rubbed with silk, skin-wool, or metal, becomes positive; but if it be excited by friction against the back of a living cat, it appears negative. Wool, silk,

or fur, rubbed against sealing-wax, are rendered positive; but gold, silver, or tin, are by the same process rendered negative.

55. Electricians have drawn up tables for showing at one view what kind of electricity will be produced by rubbing various electrics with different substances; the following Mr. Singer gives us on the authority of Mr. Cavallo.

| | Is rendered | By friction with |
|---|---|---|
| The back of a cat | Positive | Every substance with which it has been hitherto tried. |
| Smooth Glass | Positive | Every substance hitherto tried, except the back of a cat. |
| Rough Glass | Positive | Dry oiled silk, sulphur, metals. |
| | Negative | Woollen cloth, quills, wood, paper, sealing-wax, white-wax, the human hand. |
| Tourmalin | Positive | Amber, blast of air from bellows. |
| | Negative | Diamonds, the human hand. |
| Hare's skin | Positive | Metals, silk, loadstone, leather, hand, paper, baked wood. |
| | Negative | Other finer furs. |
| White silk | Positive | Black silk, metals, black cloth. |
| | Negative | Paper, hand, hair, weasel's skin. |
| Black silk | Positive | Sealing-wax. |
| | Negative | Hare's, weasel's, and ferret's skin, loadstone, brass, silver, iron, hand, white silk. |
| Sealing | Positive | Some metals. |
| | Negative | Hare's, weasel's, and ferret's skin, hand, leather, woollen-cloth, paper, some metals. |
| Baked wood | Positive | Silk. |
| | Negative | Flannel. |

In a note appended to the preceding table Mr. Singer says, Mr. Cavallo had inserted metals, which appeared to imply that the friction of all metals electrified sealing-wax positively; this I find is not the case: iron, steel, plumbago, lead, and bismuth, render sealing-wax negative, and all the other metals I have tried leave it positive. I have therefore made a slight alteration in the table. The least difference in the conditions of such experiments will occasion singular varieties of result: with the same rubber (an iron chain), positive electricity may be excited in one stick of sealing-wax, and negative in another, if the former have its surface scratched, and the latter be perfectly smooth. Many repetitions of each experiment are therefore essential to an accurate conclusion.

56. The result of experiments of the kind just described, Mr. Singer found to be much influenced by the state of the bodies employed, and the manner in which the friction was applied to them. In general, he remarks, strong electric signs can only be produced by the friction of dissimilar bodies; but similar substances, when rubbed together so that the motion they individually experience is unequal, are sometimes electrified; and, in such cases, the substance of which the friction is limited to the least extent of surface, is usually negative. This he farther remarks is the case with the strings of a violin, over a limited part of which the bow passes in its whole length, and the hairs of the bow become positive.

57. From these facts he draws the following conclusions, viz. that positive and negative electricity are concomitant phenomena, and that in all cases of electrical excitement, they are both produced, though one only may occasionally appear; and that these phenomena are not peculiar to any distinct class of bodies, but may be produced alternately in various substances, by changing the materials or method by which friction is communicated to them.

MUNICATION OF ELECTRICITY.

Cavallo, speaking of communicated remarks, that under such a title falls at we know of the subject: the irtue, says he, from one body hat causes its light; by being communicated to other bodies we see its attraction; by its quick transition it melts metals, destroys animal and vegetable life; and, in short, it is by this communication that the science is known and cultivated.

The following observations and experiments on this particular part of the subject we give from Mr. Singer, with a few necessary exceptions, preferring them to any thing we have yet seen for their appropriateness and conciseness.

59. From the few simple experiments which we have already described the reader must be aware that electricity can be communicated or conveyed from one body to another. But the faculty of electrical transmission is very different in different bodies; some convey it with great rapidity; others more slowly; and there are some that appear absolutely to arrest its progress. Examples of this fact are apparent in the most simple experiments. The divergence of an electrified electrometer may be destroyed, weakened, or maintained, by touching its cap with different bodies; now, as the divergence of the electrometer is caused by its electricity, such effects can only be produced by the relative power of the touching bodies to deprive it thereof; for so long as the electricity remains the divergence will continue unaltered.

60. This may be shown most satisfactorily by the two following experiments. (1.) Touch the cap of the electrified electrometer with a stick of dry glass, sulphur, or sealing-wax; the divergence of its leaves will continue; this shows therefore that these substances do not transmit electricity. (2.) Touch the cap of the electrified electrometer with a piece of wood, a rod of

any metal, a green leaf, or with the point of the finger; its divergence immediately ceases. Such bodies therefore permit the transmission of electricity.

61. By experiments of this kind it is found, that there is a gradation of effect from one class of bodies to the other. Those which transmit electricity with facility are called conductors; those whose transmitting powers are inferior, imperfect conductors; and such as have no power of transmission, non-conductors: but in general the various bodies in nature are divided into two classes only; the remote extremes of each forming the intermediate class.

62. In the following enumeration of the principal conductors, and non-conductors, the substances are placed nearly in the order of their perfection; but the determination of this circumstance has not hitherto been accomplished with much precision.

CONDUCTORS.

All the known metals.
Well-burnt charcoal.
Plumbago.
Concentrated acids.
Powdered charcoal.
Diluted acids, and saline fluids.
Metallic ores.
Animal fluids.
Sea water.
Spring water.
River water.
Ice above 13° of Fahrenheit.
Snow.
Living vegetables.
Living animals.
Flame.
Smoke.
Steam.
Most saline substances.
Rarefied air.
Vapor of alcohol.
Vapor of ether.
Most of the earths.
Most stones.

To the above Dr. Brewster adds powdered glass and powdered sulphur, which, he says, have been found to be conductors by the experiments of Van Swinden.

63. Many of the above mentioned substances fail to conduct electricity when they are made perfectly dry; hence it is concluded that their conducting power arises from the water they contain. Indeed this faculty does not permanently exist in any of the bodies enumerated, but varies and disappears with their modifications of temperature, &c. Thus hot water is a much better conductor than cold water is; the same is the case with charcoal and other substances.

NON-CONDUCTORS.

64. These are also denominated electrics, as before remarked, and occasionally insulators; but the latter term will only apply to the most perfect of them.

Shell-lac, amber, resins.
Sulphur, wax, jet.
Glass and all vitrifications talc
The diamond and all transparent gems.
Raw silk, bleached silk, dyed silk.
Wool, hair, feathers.
Dry paper, parchment, and leather.
Air, and all dry gases.
Baked wood, dry vegetable substances.
Porcelain, dry marble.
Some silicious and argillaceous stones.
Camphor, elastic gum, lycopodium.
Native carbonate of barytes.
Dry chalk, lime, phosphorus.
Ice at 13° of Fahrenheit.
Many transparent crystals when perfectly dry.
Ashes of animal bodies.
Ashes of vegetable bodies.
Oils, the heaviest are the best.
Dry metallic oxides.

65. The most perfect non-conductors, continues Mr. Singer, become conductors by the accession of moisture; hence the necessity of preserving them clean and dry during electrical experiments. Resinous substances, raw silk, and Muscovy talc, are least liable to attract moisture, and are therefore most useful where perfect non-conductors are required.

66. Glass becomes moist on its surface only, and this moisture may be checked by covering it with sealing-wax or good varnish. Glass consequently enters most extensively into the structure of an electrical apparatus; its strength, and the facility with which it may be procured of any form, fitting it most admirably for that purpose.

67. Many substances in the preceding list lose their non-conducting power, and become conductors, when intensely heated. Such is the case with red hot glass, melted resin, wax, &c.; but the most intensely heated air, if unaccompanied by flame, is not a conductor. Many fibrous substances attract water so readily, that it is absolutely necessary to dry and warm them before their non-conducting property appears; this is particularly the case with paper, flannel, parchment, leather, &c. The influence of heat on this property is, indeed, very remarkable. It is well exemplified in the following instance: Wood, in its natural state, is a conductor; if baked, its moisture is expelled, but its organisation is not altered: it is then a non-conductor. By exposure to a greater heat its volatile elements are dissipated, and its indestructible base (charcoal replete with alkali) only remains; this is a conductor; but if exposed again to heat, with access of air, it suffers combustion, and is converted into ashes and gases, which are non-conductors.

68. There does not appear any definite relation between the chemical characters of bodies and their conducting powers; for the best conductors (metals), and the best non-conductors (resins, sulphur, &c.), are alike inflammable substances. The products of combustion, too, are dissimilar in this respect: acids and alkalis conduct electricity, but the metallic oxides do not. Neither does it appear that specific gravity, hardness, tenacity, or crystalline arrangement of particles, are connected with the power of electrical transmision; for similar characters of this kind are possessed by bodies of both classes. Thus platina, the densest of bodies, is

a conductor; but so also are charcoal, and rarefied air.

69. Whatever be the cause of non-conducting power, it is evident that without its existence as a property of air, and other substances, electrical phenomena would be unknown; for, if the faculty of electrical transmission existed universally, the cause of every effect of this kind would be dissipated and lost at the moment of its production. But, by the property of non-conductors, any excited electricity which they surround is preserved; and it is then said to be insulated. A support of glass, sealing-wax, silk, or any non-conductor, is, for the same reason, called an insulating support, or an insulator; and a piece of metal or other conductor, so supported, is named an insulated conductor.

70. The use of insulators and conductors in practical electricity may be exemplified by very simple experiments, which, says Mr. Singer, will form no improper introduction to the consideration of more important apparatus. He gives the following:—

(1.) Hold a sheet of writing paper before a fire till it be perfectly dry and warm; lay it flat upon a table and rub the upper surface briskly with Indian rubber. The paper will adhere to the table, and if lifted up by one corner and presented quickly to any flat conducting surface, as the wainscot, &c., will be attracted by and adhere to it. This adherence is occasioned by the attraction of electricity excited on the paper, which in its dry state is an insulator or non-conductor; the necessity of which circumstance to the success of the experiment is rendered evident by the paper falling down as soon as it has attracted moisture enough to destroy its insulating property, and is further apparent from the impossibility of producing the same results by the friction of paper in its ordinary state of dryness.

(2.) Repeat the excitation of the paper in a dark room; when the paper is lifted from the table by its corner, present the knuckle of the other hand successively to various parts of its surface, a series of faint divergent flashes of light will ensue. This light is occasioned by the transmission of the electricity excited on the paper to the hand; and it occurs at every contact, because the non-conducting power of the paper prevents its transmission from one part of the surface to another, the effect existing over the whole portion that has been subjected to friction.

(3.) Excite the dry sheet of paper as before, and place it upon an insulating stand, a piece of apparatus to be described hereafter, present the knuckle to the edge or under side of the metal plate, and a bright spark will appear; but a second approach will produce either a very slight effect, or none that is perceptible; for the metal is a conductor, and it transmits the whole effect of the excited electric at once. Hence insulated conductors are employed in the electrical apparatus to receive or collect the diffused electricity of excited bodies, and to apply it to the purposes of experiment.

71. It is rather remarkable that the ingenuity of Mr. Singer did not lead him to try the experiments here detailed with brown, as well as writing paper. This idea, however, does not seem to have occurred to writers on the subject till very recently. When very coarse brown paper is used, the effects produced are much stronger; nor is there in this case any necessity for the application of Indian rubber; for if a piece of coarse brown paper, of about twelve inches long and six inches broad, be made very dry and warm, and then drawn gently three or four times between the knee and the lower part of the arm, both being covered with woollen, it will be found to be highly electrical, and will with considerable force adhere to the wainscotting of a room. If any conducting substance be applied to it immediately after the friction, such as the knuckle of the folded hand, or a brass ball, a strong spark will instantly dart from the paper to it, attended by the usual snapping sound. So powerful indeed is excited brown paper, when carefully managed, that a small jar may be charged with it; and it has been recently proposed as a covering for a circular board to be used instead of a plate of glass in constructing a cheap kind of electrical machine.

## PART II.

### ELECTRICAL APPARATUS.

[illegible]ous, extremely beautiful, and de-[illegible]ments may be made in electricity with but a small quantity of apparatus, and that of a simple form, and at a trifling expense. Such an apparatus consists chiefly of a few glass tubes, of about an inch in diameter and two or three feet long; one or two very large sticks of sealing-wax; a few pieces of silk, old silk handkerchiefs answer extremely well; a few pieces of new flannel; some wires and balls of different sizes; and half a dozen small balls made of the pith of elder.

But, when it is required to exhibit the more striking and important of the electrical phenomena, we must have recourse to a much more powerful, complicated, and consequently expensive apparatus.

73. The principal article, the very fountain, so to speak, of all electrical apparatus, is what is commonly denominated the electrical machine; of the structure of this instrument we have various accounts in different works on electricity, but as it is not our intention to swell our pages with a repetition of what others have said before us on what is now become obsolete, we shall not put our readers to the trouble of travelling over an uninteresting description of apparatus which has nothing to recommend it but its antiquity.

74. Of the *Electrical Machine*, there are now various kinds in use; these, however, may be classed under two heads, the cylindrical and the plate machine. But before entering on a particular description of these we feel strongly inclined to lay before our readers the following remarks of Mr. Singer on electrical apparatus in general.

75. The structure of an electrical apparatus, says this distinguished electrician, consists in the judicious arrangement of insulators and conductors, so that the former shall prevent the dissipa-

tion of the effects the latter are employed to collect or transmit; thus the cap and leaves of the gold leaf electrometer form a conductor intended as a test of electrical action; but to fit this conductor for its purpose it is insulated, being supported on the glass cylinder by which the leaves are enclosed.

76. When electricity is excited by friction, the quantity of effect is, within certain limits, proportioned to the extent of the rubbed surface; hence it appears that every part of that surface is concerned in the production of the general effect. Now, that this may be the case, it is essential that every part of such surface be insulating; for friction is a progressive process, a succession of contacts; and the effect produced by it in the first instant would otherwise be destroyed by conducting power, before a second operation could contribute to its increase. For this reason electricity is most usually excited by the friction of a conductor of limited size, against the extensive surface of a non-conductor.

77. An apparatus, then, properly arranged for the excitation of electricity, is called an electrical machine. To excite positive electricity, a glass tube, of about an inch in diameter and two feet long, is generally used; the excitation is produced by rubbing it lengthwise by a piece of dry oiled silk, held in the hand which is made to grasp the tube. In this way both the silk and the tube are electrified; but the electricity of the silk is destroyed by the conducting power of the hand, and that of the tube only appears. In a similar way negative electricity is procured by rubbing a large stick of sealing-wax with dry flannel or fur; the electrical power of the sealing-wax being all that results.

78. Thus, with the most simple machinery, two processes are employed to procure the opposite electricities, although they are at the same time both excited in each; but, to obtain them both, it would be necessary to insulate the silk, or flannel, used as rubbers, either by employing them in a very dry state, rolled up, so as to produce the friction with one extremity, at a distance from the hand, or by affixing them to a glass or other non-conducting support; but neither of these methods would be convenient where many experiments are to be made. This difficulty does not occur when large surfaces of glass are employed instead of tubes as sources of excitation; for these may be made circular, and proper friction be communicated to them from a fixed cushion, placed on an elastic support, against which they are made to revolve.

79. We shall here give a brief description of the two forms of the electrical machine which are most generally approved of, and shall begin with the cylindrical machine. In point of power, the very best kind of cylindrical electrical machine with which we are acquainted is the improved one, as constructed by the late Mr. Geo. Adams, of London, an eminent lecturer, and author of several valuable philosophical works. This machine is represented in plate I, fig. 1, ELECTRICITY. The parts of the machine, which fall more immediately under our attention are, (1.) The electric, or the glass cylinder which is to be excited. (2.) The mechanical contrivances by which it is put in motion. (3.) The cushion and its appendages. (4.) The conductor or conductors. The glass cylinder of the machine is put in motion by a simple winch. This is less liable to be out of order than those that are turned with a multiplying wheel, and also enables us to excite the machine more powerfully. The cylinder, FGHI, is supported by two strong perpendicular pieces, DE. The axis of one cap of the cylinder moves in a small hole at the upper part of one of the supports. The opposite axis passes through the upper part of the other support. To this axis the winch or handle is fitted. The cushion is supported and insulated by a glass pillar; the lower part of this pillar is fitted into a wooden socket, to which a regulating screw is adapted, to increase or diminish the pressure of the cushion against the cylinder. A piece of silk comes from the under edge of the cushion, and lies on the cylinder, passing between it and the cushion, and proceeding till it nearly meets the collecting points of the conductor. The more strongly this silk is made to adhere to the cylinder, the stronger is the degree of excitation. Before the cylinder, or opposite to the cushion, is a metallic tube, YZ, supported by a glass pillar LM. This is called the conductor, and sometimes the prime conductor. For the more conveniently trying experiments with this machine, and exhibiting the different states of the cushion and conductor, there are two wires to be fixed occasionally, the one to the conductor, the other to the cushion; on the upper part of these are balls furnished with sliding wires, that they may be set apart from each other at different distances.

80. It is matter of surprise that this simple and very powerful electrical machine should have totally escaped the notice of some modern writers on the subject, who have taken much pains to describe others of far inferior importance. This remark is equally applicable to another form of the cylindrical machine which is but little known, but which has many good qualities to recommend it to the attention of those who prefer the cylinder to the plate machine. The principle on which this machine, as well as that just described, is constructed, is that adopted by Mr. Nairne; but whatever of improvement it possesses is due, we believe, to Mr. Bywater, author of an excellent little work on electricity. The following is Mr. Bywater's own description of this machine: AAAA, fig. 2, is the board on which the supporters and pillars are erected, and by which the machine is made fast with cramps to a table. BBBB are two wooden pillars or supporters, the lower ends of which are morticed into the board AAAA, and in the upper ends of which the axis of the cylinder CCCC turns. DD is the winch by which the cylinder is turned on its axis. EE is a piece of wood, a part of which is slided into a groove under the board AAAA, and made fast by the thumb-screw *f*. GG is a glass pillar, which is fixed to the wood EE, and supports what is called the negative conductor and rubber HH. II is another piece of wood, part of which is slided into a similar groove under the board AAAA, and is made fast by the thumb-screw *j*. KK is a glass pillar fixed into the wood II, and supports the prime conductor LL; to this con-

ductor a number of metallic points are attached, to collect the electric fluid which flows on the surface of the cylinder. M M is a rod of brass inserted in the prime conductor, having a joint by which it may be raised or lowered, to suit the height of the apparatus; this rod is a most useful appendage to the prime conductor. To the upper part of the rubber a piece of black silk is attached, which proceeds from thence over the top of the cylinder, to within about half an inch of the points of the wires inserted in the prime conductor; by which means the fluid that is brought into action by the attrition of the cylinder and rubber is prevented from being dissipated in the air, and carried round with the cylinder to the prime conductor. The action of the silk on the cylinder tends very much to increase the excitation of the machine, as may be seen by removing the cushion a little back from the cylinder, and leaving the silk to act upon it alone, in which case the excitation will often be found to be scarcely less than when the rubber is also in contact with the cylinder.

81. The plate machine, like the cylindrical, has had a few varieties introduced into its construction at different times. The largest specimen of this instrument is that which was constructed by Mr. Cuthbertson, for Tyler's museum, at Haarlem. The following will convey to the reader's mind some idea of the powers of this immense machine; and its construction will be readily understood by the description which we shall add of the most improved form of the instrument. It consists of two circular plates of glass, each sixty-five inches in diameter, and made to turn upon the same horizontal axis, at the distance of seven inches and a half from one another. These plates are excited by eight rubbers, each fifteen inches and a half long. Both sides of the plates are covered with a resinous substance to the distance of sixteen inches and a half from the centre, both to render the plates stronger, and likewise to prevent any of the electricity from being carried off by the axis. The prime conductor consists of several pieces and is supported by three glass pillars, fifty-seven inches in length. The plates are made of French glass, as this is found to produce the greatest quantity of the electricity next to English flint, which could not be produced of sufficient size. The conductor is divided into branches which enter between the plates, but collect the fluid by points only from one side of the plate. The force of two men was required to work this machine; but when it is required to be put in action for any length of time, four are necessary. At its first construction nine batteries were applied to it, each having fifteen jars, every one of which contained about a foot square of coated glass; so that the grand battery, formed by the combination of all these, contained 135 square feet. The effects of this machine are astonishing: but Dr. Van Marum, who principally made experiments with it, imagining that it was still capable of charging an additional quantity of coated glass, afterwards added to it ninety jars of the same size with the former; so that it now contains a coated surface of 225 feet, and the effects are found to be proportionable.

82. The principal objection to the plate machine has hitherto been the difficulty of insulating for the purpose of producing negative electricity. This objection is now removed; and, by using the machine as constructed by Mr. Cuthbertson, both kinds of electricity are produced with ease. The following description of this beautiful and powerful instrument is given by Dr. Brewster in the Appendix to his new edition of Ferguson's Essays. Fig. 3 is a representation of this machine: A B is a circular disc of plate glass, supported upon an horizontal axis, the ends of which rest upon two upright pillars E F. By turning the winch or handle, W, a rotatory motion is given to the plate, which is excited by two rubbers X, Y, fixed at the opposite ends of a diameter of the circle. Each rubber consists of two cushions, which embrace the outer margin of the glass plate, as shown in the figure. The conductor, which is made of brass, is shown at C D, and it is attached to the upright pillar E by the glass rod R. To the right hand of C, and above B, are seen the points for the receiving the electricity from the machine. From each rubber there proceeds to within a little of the points, a flap or double piece of oiled silk, which prevents the dissipation of the electricity.

As it is difficult to insulate the rubbers of the plate machine, without giving it an unseemly appearance, Mr Cuthbertson introduced the practice of insulating the whole machine by the glass supports G, H, I, K, so that negative electricity can thus be obtained as easily as positive.

83. The cylindrical machine, however, being at present in more common use than the plate machine, it is hoped the following remarks may be of use to those who possess such an instrument, and particularly to such as may be disposed to provide themselves with it for the sake of economy. A cylindrical electrical machine ought never to be less than ten inches in diameter; there are cylinders of six, seven, eight, and nine inches diameter, often neatly mounted, and sold by the philosophical instrument makers, but they are of no manner of use for the purpose of experiment, and serve only as a kind of philosophical toy, for the amusement of children, and that too on a very narrow scale. To construct such machines, therefore, is an absolute waste of the materials. With a cylinder of ten inches, properly managed, a tolerable exhibition may be made, but the most convenient size is from twelve to sixteen, the length of the cylinder being in proportion.

84. The most powerful excitation of the machine is produced as follows:—Let the machine be placed within the influence of a good fire, but not so near as to injure any of its parts by the action of the heat. With a flat round pointed knife spread a little amalgam evenly along the cushion, and return it to its place: turn the cylinder a few times round; then take off the cushion, and observe carefully those parts on its surface that have not been touched by the cylinder while revolving; on these parts put a little more amalgam, and repeat the process of turning the cylinder, and supplying the defective parts with amalgam, till every point of that part of the surface of the cushion which presses on the cylinder appears to be properly supplied with

amalgam. Take now a piece of leather about five or six inches square, and spread over one side of it a quantity of amalgam; throw back the silk flap, and, turning the machine gently round, apply the amalgam side of the leather to the cylinder for the space of two minutes or more, as circumstances may require, during which time the excitation will be observed to increase rapidly. The cylinder must next be wiped perfectly clean with an old silk handkerchief, and afterwards with a soft dry linen cloth. Let the cushion be again removed; and the amalgam which appears above and below the line of contact with the cylinder carefully scraped off, the silk flap wiped with a linen cloth, and the whole returned to its place and made fast. If now the cylinder be turned slowly round, streams of the electric fluid will be seen rushing from the silk flap round the lower part of the cylinder, attended with a hissing and snapping noise, while large brushes of the same, of several inches in length, may be observed flying off from the lower edge of the silk into the surrounding air. The machine is now fit for use, and may be fastened to the table, after which the whole of its parts are to be well wiped with a warm and dry linen cloth to free them from dust.

85. The operator, however, must [illegible] expect this high and rich state of excitation [illegible] long duration. The cylinder will soon [illegible] dust will be attracted by the action of the machine; and the moisture produced in the air of the room by the breath of his audience, will, by their united effects, render all his efforts to produce a copious supply of electricity entirely fruitless.

86. To remedy this defect, which gentlemen who deliver public lectures on electricity have often found to be a grievous one, provide a box of thin plate iron, ten or twelve inches long, four inches wide, and one inch and a half in depth, with a lid to fit very easily over it. In this box a piece of bar iron of about six inches in length, three in breadth, and half an inch in thickness, after being heated in the fire to a dull red heat is to be placed, the lid of the box put on, and the whole, on a suitable iron stand, placed under the cylinder, on the board of the machine in a longitudinal direction. The radiation of heat from the iron will effectually preserve the equality of the temperature of the surrounding air for a considerable length of time, and indeed for any length of time required, since, by employing two bars of iron, the one may be kept in the fire while the other is in the box, and thus no other interruption in the course of the experiments will be necessary beyond what is occasioned by the changing of the irons. By this means the machine may be made to act in full vigor under the most disadvantageous circumstances.

87. Dr. Brewster mentions a method used by Mr. Ronalds of aiding the excitation of the machine, which he represents as being attended with the greatest advantages. He thus describes it: In the cylinder machine, the rubber is placed in front of a half cylinder of copper, which communicates with a copper pipe, that serves for the support of the rubber. A very small spirit-lamp, whose burner consists of only one thread of cotton, is placed immediately beneath the mouth or lower end of the copper pipe, so as to keep the rubber and the parts adjacent to it always hot and dry. Besides this contrivance, Mr. Ronalds places his prime conductor upon a glass support, so that a similar spirit-lamp may be placed below it in order to convey heat to its interior.

Mr. Ronalds remarks, that a cylinder machine thus constructed, of half the dimensions of one made upon the usual plan, is highly and permanently effective. The same principle may easily be applied to plate machines. The heat is supposed to assist the excitement by promoting the oxidation of the amalgam.

88. This method may certainly, in some degree, prove beneficial; but it will be found to be in many respects inferior to the simple method above mentioned. In the first place, the radiation of heat will be neither so general nor so great; in the second place, the flame of a lamp or a candle absorbs the fluid; and in the third place, the light, which must necessarily be emitted from two spirit-lamps, would prove highly detrimental to the effect of those experiments which require to be performed in darkness. To which may be added, the expense of the lamps, and the spirit to be consumed.

89. Where a plate machine of large dimensions is used, this additional article will not be required; for the great thickness of the glass renders it capable of retaining the heat much longer than can be done by a thin cylinder; for which reason it must be obvious that, if cylinders were made much stronger than they generally are, their action would be effectual for a greater length of time than it is. Opinion, however, runs in favor of thin cylinders, but the consistency of such opinion remains to be shown. It is well known that the old globular machines, which were made of thick glass, when once put in a state of powerful excitation, retain that state much longer than the modern thin cylinder will do under the same circumstances.

90. The following directions for preparing the amalgam for electrical machines are given by Mr. Singer, in his treatise, already mentioned. Melt in an iron ladle two ounces of zinc with one ounce of tin, and, while this mixture is in a fluid state, pour into it six ounces of mercury; let the whole be then put into an iron or wooden box, and agitated until it be quite cold. It must then be reduced to fine powder in a mortar, and mixed with sweet hogs' lard to the consistence of thick paste. This part of the process need not be performed till the amalgam is wanted for use. This amalgam, he remarks, answers exceedingly well, but, he afterwards adds, I have since made it with a still less proportion of mercury with equal effect. The proportions may be two ounces of tin, four ounces of zinc and seven ounces of mercury. The mercury must be heated to about 300° Fahrenheit, before the fused metals are added to it. When thy amalgam has been agitated until cool, and finely powdered, it is to be mixed with hogs'-lard be trituration in a mortar; and should it at any time become hard, more lard must be added and the trituration be repeated.

91. The application of the electrical apparatus to the purpose of experiment will afford the best

illustration of its subordinate parts; and, in adopting this plan, we shall be enabled to give such an arranged view of the chief properties of the electrical fluid as may be of service in aiding the inexperienced electrician in making an orderly display, instead of a series of experiments which have no regular connexion, and in which sometimes one property, and sometimes another, is illustrated. We shall commence with some observations on the action of the machine itself, and for these we must acknowledge our obligation to Mr. Singer.

92. The machine being prepared according to the directions already given, and the cushion pressed moderately against the cylinder by the action of its adjusting screw, it may be put in motion, and the following phenomena will be observed. 1. Distinct lines of light, accompanied by lateral scintillations, pass from one conductor to the other, across that part of the cylinder which is not covered by the silk flap; these are called electrical sparks. 2. Bright sparks pass between either of the conductors and the knuckle, or any smooth uninsulated substance presented to them at a moderate distance; and if received on the knuckle, or any part of the body, produce a painful sensation. 3. These effects are more distinct, and the sparks from each conductor stronger, when they are taken from both at the same time. 4. The power of the spark from either the positive or negative conductor, singly, will reach its maximum when the opposite conductor is uninsulated, by suspending a chain or wire from it to the ground. 5. If the two conductors are connected by a wire, or other conducting substance, the most vigorous friction of the cylinder will not electrify either. 6. If, instead of a wire, the conductors are connected by a silk string on which a number of shot or metal beads are strung, at the distance of a twentieth of an inch from each other, a series of bright sparks will pass between the beads as long as the turning of the machine is continued. It must be remembered, that the conductor to which the cushion is fixed shows the electrical phenomena of the cushion, and the opposite conductor, that of the electricity of the glass cylinder; hence the observation of their phenomena is properly an observation of the circumstances that occur in all cases when electricity is excited by friction.

93. On these very beautiful phenomena, Mr. Singer makes the following judicious observations. The first and second phenomena seem to show that the cause of electricity is corporeal; for sensation is affected by it, and a mechanical impulse experienced, which it is difficult to ascribe to any other than a material cause. The third phenomenon proves that there is a mutual action between the electricities excited in the opposite conductors; since their effects are more powerful when directed at the same time to one conducting body. The fourth phenomenon shows that the same relation which is observed between the opposite electrified conductors exists also between either of them and the ground, but in a different degree. By the fifth phenomenon it is seen that positive and negative electricity, if excited to the same extent, and united by conducting matter, exhibit no electrical phenomena. The sixth phenomenon is observed to show that when the conductors are connected, the machine continues to excite electricity, but is prevented from displaying it by their mutual contact.

94. From these appearances the following explanation of electrical phenomena may be deduced:—1st. The cause of electrical phenomena is material, and possesses most of the properties of an elastic fluid. 2. This electric fluid attracts and is attracted by all other matter, and, in consequence of such attraction, exists in all known substances. 3d. The attraction of different bodies for the electric fluid is various, so also is that of the same body under different circumstances, consequently the quantity of electricity naturally existing in different substances may be unequal; and the same body may attract more or less than if alone, when combined with other matter: but its original attraction will be restored by destroying the artificial combination. 4th. From some peculiarity in the nature of the electric fluid, its attraction for common matter is more influenced by figure than by substance; and consequently is stronger in extensive than in limited surfaces. 5th. From this pecu- … moves with great facility over the … ough the substance of some bodies, … ed in its progress by others. 6th. … ction of any substance for elec… to the electric fluid it contains, … ubstance will evince no electrical signs; but these are produced when there is either more or less electricity than is adequate to the saturation of the existing attraction: if there be more, the signs will be positive; if less, they will be negative.

95. Electrical excitation then, may be thus effected:—The bodies employed have each a certain quantity of the electric fluid proportioned to their natural attraction for it; this they retain, and appear unelectrified so long as they remain in their natural state. And, if two such bodies are brought in contact, their natural attractions will be altered, one of them attracting more than in its separate state, and the other less; the electric fluid thus diffusses itself amongst them in quantities proportioned to their relative attractions, and hence they appear unelectrified. But if they are suddenly separated, the new distribution of the electric fluid remains, whilst the original attractions are restored, and as these are not equal to each other the bodies will appear electrical; that of which the natural attraction was increased by contact, having received an addition to its quantity of electric fluid, will be positively electrified; and the other will be negative.

### Attraction and Repulsion.

96. The motion of light bodies produced by electricity, is usually called attraction and repulsion, and is occasioned by the mutual attraction existing between the electric fluid and common matter. In practical electricity there are numerous methods of illustrating this motion; the following are some of the principal.

(1). Fix at the end of the prime conductor a knobbed rod, and hang on it two small pith-balls, suspended by threads of equal length. The

balls will now touch one another, the threads hanging perpendicularly, and parallel to each other. But if the cylinder of the machine be turned, by turning the winch, then the pith balls will repel one another, more or less according as the electricity is more or less powerful. If the electrometer be hung to a prime conductor negatively electrified, i. e. connected with the insulated rubber of the machine, the balls will also repel each other. If, in this state of repulsion, the prime conductor is touched with some conducting substance not insulated, the pith balls will immediately come together. But if, instead of the conducting substance, the prime conductor is touched with an electric, as a stick of sealing wax, a piece of glass, &c., then the pith balls will continue to repel each other; because the electric fluid cannot be conducted through that electric.

(2.) Take a small downy feather or a pith ball suspended by a thread, and, holding the thread, bring the ball near an electrified conductor, either positive or negative: the ball will be attracted by the electrified conductor, and adhere to it, until its electricity is destroyed.

Such bodies as are positively electrified, tend to diffuse their superabundant fluid amongst surrounding substances; and those that are negative, endeavour to acquire electric fluid [illegible]ence, either state of electricity will produce attraction; for if light bodies are to be moved, it is indifferent whether the electrified surface attracts their natural electric fluid, or the matter to which it is attached; for the attraction arises only from the different proportions of these in any two bodies, and will of course continue whilst that difference exists.

(3.) Repeat the preceding experiment with a ball or feather supported by a silk thread: the light body will first be attracted to the electrified conductor, and will then recede from it; nor can it again be brought in contact until it has touched some conducting substance. Mr. Singer thus explains the cause of this:—The light body is here attracted for the same reason as before, but it is insulated, and consequently receives, by contact with the electrified surface, a similar electric state; it therefore recedes from that surface, being attracted by the ambient air, or other surrounding bodies; for they have their natural portion of electricity, and therefore differ from the light body, which has either more or less; but the electrified surface does not differ from the light body, and consequently cannot attract it, till, by touching some conductor, its natural electric state is restored.

(4.) The following is a very pleasing variety of the last-mentioned experiment.—Take a glass tube, whether smooth or rough is not material, and, after having rubbed it, let a small light feather be let out of your fingers at the distance of about eight or nine inches from it. This feather will be immediately attracted by the tube, and will stick very close to its surface for about two or three seconds, and sometimes longer; after which it will be repelled; and, if the tube be kept under it, the feather will continue floating in the air at a considerable distance from the tube, without coming near it again, except it first touch some conducting substance; and, if the tube be managed dexterously, you may drive the feather through the room at pleasure. This experiment may be varied as follows: A person may hold in his hand an excited tube of smooth glass, and another may hold an excited rough glass tube, a stick of sealing-wax, or any other electric negatively electrified, at about one foot and a half distance from the smooth glass tube; a feather now may be let go between these two differently excited electrics, and it will leap alternately from one electric to the other.

(5.) Place a leaf of gold, silver, or other metal, on the palm of the hand, and bring it within a few inches of an electrified conductor; it will be attracted and continue to move, alternately from the hand to the conductor, as long as the latter is electrified.

(6.) Suspend from the conductor, by a brass chain, a circular plate of copper, reaching to within an inch and a half or two inches of the table. Directly under this plate place another of the same form, and a little larger, on the table. Turn the machine, and the fluid will pass from the upper to the lower plate. If now small figures cut out of pasteboard, or pith of elder, be introduced between the plates, they will dance about with apparent vivacity, and sometimes appear to course round the edge of the lower plate. This experiment is represented by fig. 4.

(7.) The electrical bells furnish a pleasing illustration of the attraction and repulsion of the electric matter. They are variously constructed, but the form exhibited fig. 5 is the simplest. The two outer bells are suspended by brass chains; the middle bell and the two clappers by fine silk threads. When the bells are attached to the conductor, and the machine is turned very gently, the fluid will pass along the chains to the two outer bells, but will not pass along the silk to the clappers and middle bell. Thus the outer bells being charged with an extra quantity of fluid will attract the clappers, but the moment they touch the bells they become charged, and are repelled with such force as to cause them to strike against the middle bell, on which they deposit their electricity, and are again attracted. By this means a constant ringing is kept up while the machine is turned. From the inside of the middle bell a brass chain passes to the table, for the purpose of conveying away the fluid deposited on it by the clappers. A more elegant form of the electrical bells is thus made:—Fix eight bells near the edge of a circular board supported on four feet, fig. 6, having a glass pillar *e*, in the centre, terminated by a point *g*. On this point place the pointed wires used in the last experiment, hanging from one of them, as *d*, a small glass clapper by a silken thread; and connecting the apparatus by a chain *h*, proceeding from the prime conductor. On setting the machine in motion, the wire will move round, and the clapper ring the bells.

(8.) Place a pointed wire on the machine, electrify the inside of a dry glass tumbler by holding it over the wire whilst the machine is in motion; place some pith balls on the table and cover them with the electrified glass; they will be

alternately attracted by it and the table, and continue their motion for some time. See fig. 7. An instrument is constructed on purpose for this experiment, by which the dancing of the balls may be kept up for any length of time, as it may be connected with the conductor.

(9.) Insulate a circular ring of brass so as to stand about an inch and a half from the flat surface of a table; connect the brass ring with the conductor of the electrical machine, and place within it on the table, a very light and round glass ball of two inches diameter; the ball will be attracted by the ring, touch it, and become electrified at the point of contact; this point will then recede and be attracted by the table, whilst another part of the ball is attracted by the ring; and, by the repetition of this process, the ball is made to revolve and travel round the circumference of the ring.

(10.) Fasten a small piece of sealing-wax on the end of a wire, and set fire to it. Then put the electrical machine in motion, and present the wax, just blown out, at the distance of a few inches from the prime conductor. A number of very fine filaments will immediately dart from the sealing-wax to the conductor, on which they will be condensed into a kind of net-work, resembling wool.

If the wire with the sealing-wax be fixed into one of the holes of the conductor, and a piece of paper be presented at a moderate distance to the wax, just after it has been ignited, on putting the machine in motion, a net-work of wax will be formed on the paper.

If the paper on which the wax is thus received be gently warmed, by holding the back of it near the fire, the wax will adhere to it, and thus the result of the experiment will be rendered permanent. A remarkably fine experiment of the same kind may be made with camphor. Let a silver spoon containing a piece of lighted camphor be made to communicate with an electrified body, as the prime conductor of a machine; while the conductor continues electrified, by keeping the machine in motion, the camphor will throw out numerous ramifications, and appear to shoot like a vegetable.

(11.) Take about a dozen of flaxen threads and tie them together at top and bottom; annex them to the conductor of the electrical machine; when electrified the threads will separate from each other, and the knot at the bottom rising they will assume a spheroidal figure, which will continue as long as they are electrified.

(12.) The following experiment we give as being one of the earliest made by Dr. Franklin in illustration of the principle of attraction and repulsion. Fig. 8 represents an electric jar, having a wire C D E fastened on its outside, which is bent so as to have its knob E as high as the knob A. A is a spider made of cork, with a few short threads run through it to represent its legs. It is fastened at the end of a silk thread, proceeding from the ceiling of the room, or from any other support, so that it may hang mid-way between the two knobs A and E, when the jar is not charged. Let the place of the jar upon the table be marked; then charge the jar, by bringing its knob A in contact with the prime conductor, and replace it in its marked place. The spider will now begin to move from knob to knob, and continue this motion for a considerable time, sometimes for several hours. The inside of the jar being charged positively, the spider is attracted by the knob A, which communicates to it a small quantity of electricity; the spider then becoming possessed of the same electricity with the knob A, is repelled by it, and runs to the knob E, where it discharges its electricity, and is then attracted by the knob A, and so on. Thus the jar is gradually discharged; and, when the discharge is nearly completed, the spider finishes its motion.

## Effect of Points on the Electric Fluid.

97. The facility with which pointed bodies transmit electricity has given rise to several very delicate and beautiful experiments on the electrical apparatus, of which the following are the most deserving of attention.

(1.) *The Electrical Flies.*—These flies are composed of small brass wires, fig. 9, fixed into a cap of brass, easily moveable upon an axis of the same metal, and exactly balanced, so that they may turn with the smallest force. The ends, which ought to be very sharp, are all bent one way, with regard to one another, as those belonging to *a*, *b*, in the figure; though the two sets of points constituting the two flies there represented are contrary to each other; so that the whole flies must have a contrary motion. Fixing the axle with the two flies upon the prime conductor, and working the machine, both will begin to turn very swiftly, each in a direction contrary to that of the points. In this manner, with a powerful machine, several flies may be made to turn either in the same or in contrary directions; and by their gradual increase or decrease in size may represent a cone or other figure; for the course of each will be marked by a line of fire, and thus the whole will exhibit a beautiful appearance in the dark. The light is more brilliant when the ends are slightly covered with sealing-wax, grease, or other electric matter. The flies, in this experiment, turn the same way whether the electricity be positive or negative; the reason of which is that in positive electricity the fluid issues from the body electrified, and that in negative electricity it enters into it. In the former case, the recoil of the fluid, which acts equally on the air and on the point from whence it issues, must continually urge the point the contrary way; and in negative electricity, when the point solicits a continual draught of electric matter from the air, the direct impulse of the former must also produce a motion in the point in the course in which the fluid itself moves. In vacuo no motion is produced; because there is no air on which the fluid may act when it issues from the point.

(2.) *The Electrical Orrery*, fig. 10, is another instrument frequently used for showing the effect of points in the transmission of the electric fluid. The principle of its action is this: the ball S represents the sun, E the earth, and M the moon, connected by wires *a c* and *b d*; *b* is the centre of gravity between the earth and moon. These three balls and their connecting

wires are hung and supported on the sharp point of a wire A, which is stuck upright in the prime conductor B of the electrical machine; the earth and moon hanging upon the sharp point of the wire *c a e*, in which wire is a pointed short pin, sticking out horizontally at *c*; and there is just such another pin at *d*, sticking out in the same manner, in the wire that connects the earth and the moon.

When the cylinder of the electrical machine is turned, these balls and wires are electrified; and the electrical fire, flying off horizontally from the points *c* and *d*, causes S and E to move round their common centre of gravity *a*, and E and M to move round their common centre of gravity *b*. And as E and M are light, when compared with S and E, there is much less friction on the point *b*, than S and E make about the point *a*. The weights of the balls may be adjusted so, that E and M may go twelve times round *b*, in the time that S and E go once round *a*.

(3.) *The Electrical Inclined Plane* affords another and a still more beautiful illustration of the same thing, showing also that a stream of the electric matter issuing from points possesses force sufficient to counteract the power of gravitation in light bodies. Fig. 11 represents the inclined plane, where A is a board of mahogany, fourteen inches long and [illegible] inches broad; BBBB are four glass pillars, three-tenths of an inch in thickness; the length of the two longer is seven inches, and that shorter is five inches.

From the longer to the shorter pillars are stretched two fine brass wires, parallel to each other, and tightened by screws which pass through the brass balls which surmount the pillars. On these wires the axis of the fly C rests, the ends of which are formed like a small pulley, having a groove in them to prevent their slipping off the wires, and to guide the fly when in action. It is obvious that, if the fly be placed on the upper part of the wires, it will roll down them by its own gravity; but when it has reached the bottom of the plane, if the upper end of the wires be connected with the machine while in action, the escape of the fluid from the points will cause it to roll very rapidly up the plane till it reach the top of it. These experiments may be varied to a great extent, and models of corn-mills, water-pumps, astronomical clocks, &c., constructed of cork and pasteboard are readily put in action by directing against their main wheels a stream of electricity from a strong pointed wire inserted into the prime conductor.

(4.) By a fine flaxen thread attach a large downy feather to the prime conductor of the machine; turn the cylinder gently round, and the fibres of the feather will repel each other; approach it with a brass ball, or with the closed hand, and it will endeavour to turn itself towards the ball or hand; but present a pointed wire to it, and it will instantly shrink from it back on the conductor, as if animated, which arises from its being suddenly deprived of its electricity by the point. This experiment may be varied by inserting the brass stem of fig. 12, into one of the holes in the prime conductor. The action of the machine will cause the hairs on the head to diverge from each other, and to stand on end.

98. Such, says Mr. Singer, are the principal phenomena of motion produced by the action of electricity; they are susceptible of almost unlimited variety, but uniformly result from the simples already stated, namely, the attraction of the electric fluid for common matter, its tendency to equal diffusion; and the occasional interruption of these properties by non-conducting power and altered force of attraction.

### Luminous Exhibition of Electricity.

99. It may be necessary to observe here that all experiments made for the purpose of displaying the brilliancy of the electric matter, in passing from one conducting substance to another, should be made in a darkened room, as the presence of either natural or artificial light robs them of more than half of their beauty. The articles of apparatus, too, must be all free from dust, and perfectly dry, besides being a little warm, otherwise the effect expected will not result; we think it particularly necessary to observe that in any experiment requiring the exhaustion of glass vessels the above precautions are peculiarly needful, as we have seen some of the following experiments utterly fail in the hands of public lecturers merely from inattention to them. 135

100. To render the electrical fluid luminous it must be collected in considerable quantities, and the brilliancy of the display will depend on the particular configuration of the conducting surface over which it is made to pass. The light evolved in ordinary cases, says Mr. Singer, extends only to faint flashes and scintillations, sparks being only produced when these effects are concentrated, as they are in the electrical machine by the action of its conductors.

101. There are three circumstances that influence the electric spark in its passage from one conductor to another, namely, the form of the conductors, their extent, and the nature and density of the medium through which the spark passes. The following remarks on these three circumstances we give nearly in Mr. Singer's own words.

102. The distribution of electricity on conductors has but little relation to their solid contents, and depends almost entirely on extent of surface, for the same effects are produced by the thinnest cylinder or sphere of metal as by the most compact solid body of the same form and dimensions; it is probable that the action of insulated conductors consists in the ready communication of their electric state to the contiguous surface of the extensive stratum of air by which they are surrounded, and to the facility they present to the discharge of that electrified stratum when an uninsulated or differently electrified body is brought near them; for every positively electrified conductor is surrounded by a positive atmosphere, and every negative conductor with a negative atmosphere whose densities decrease as the square of their increased distance. Hence any insulated electrified body will retain its electrical state until its intensity is sufficient to

overcome the resistance of the air, and the greater or less interval through which the spark passes is called the striking distance.

103. When the surface of the conductor is uniform, the re-action of the air around it is also uniform; but if the surface of the conductor be irregular, the tendency of the electric fluid to escape or enter it will be greatest at the most prominent parts, and most of all when these are angular or pointed. To understand this it is only necessary to recollect that every electrified conductor is surrounded by an atmosphere of its own figure, the contiguous surface of which is similarly electrified: and that electricity is not transmitted through air, but by the motion of its particles.

104. For this motion of particles is resisted by a uniform surface from the similar action of the air around it, which is all equally capable of receiving electricity, and cannot tend to distribute it in one direction more than another; the immediate electrical atmosphere of the conductor will be therefore resisted in any attempt to recede from it by a column of air which is equally opposed in every part; but if there be any prominent point on the conductor projecting into the atmosphere, it will facilitate the recession of the electrified particles opposite to it by removing them farther from the electrified surface, and opposing them to a greater number of such as are unelectrified.

105. The action then, of bodies that are pointed or angular, appears to consist in promoting the recession of the particles of electrified air, by protruding a part of the electrical atmosphere of the conductor into a situation more exposed to the action of the ambient unelectrified medium, and thereby producing a current of air from the electrified point to the nearest uninsulating body. Hence the most prominent and the most pointed bodies are such as transmit electricity with the greatest facility, for with them this condition is most perfectly obtained.

106. A spherical surface is that which, considered with regard to its surrounding atmosphere, is most uniform; hence balls, or cylinders, with rounded ends, are naturally employed for insulated conductors, and their magnitude is proportioned to the intensity of the electrical state they are intended to retain; for a point is but a ball of indefinite diameter, and will act as such on very small quantities of electricity; and a ball of moderate size may also be made to act as a point by electrifying it strongly.

107. If two spheres of equal size are connected together by a long wire and electrified, their atmospheres will extend to the same distance, and they will of course have respectively the same intensity; but if the spheres be of unequal size, the atmosphere of the smallest will extend furthest, and it will necessarily have the greatest intensity; so that a longer spark can be drawn from a small ball annexed to the side of a conductor than from the conductor itself, and longer in proportion as the ball projects farther from the side. Hence the finer the point, and the more freely it projects beyond any part of the conductor to which it is annexed, the more rapidly will it receive or transmit electricity.

108. Let, for example, a fine point be fixed in the axis of a large brass ball, from beneath the surface of which it may be protruded more or less by the action of a fine screw, the effect of a ball of any size may be obtained; when beneath the surface of the ball the point does not act, but in proportion as it is protruded it increases the transmitting power, and, if projected far enough, at length entirely overcomes the influence of the ball.

109. The same writer gives the following experiments, among others, for illustrating the influence of the form and extent of the conductor on the appearance of the electric spark.

(1.) Present a brass ball of about three inches in diameter to the positive conductor of a powerful electrical machine; sparks of brilliant white light will pass between them, accompanied by a loud snapping noise: to produce these sparks in rapid succession the ball must be brought near the conductor, and they then appear perfectly straight.

(2.) Annex a ball of an inch and a half or two inches diameter to the conductor, so as to project three or four inches from it; present the large ball to this, and much longer sparks will be obtained than from the conductor itself, but they will be less brilliant and of a zigzag form.

(3.) Substitute a small ball for that used in the former experiment; the fluid will now pass to a greater distance, but in the form of a divided brush of rays faintly luminous, and producing little noise; this brush will even occur with larger balls, if the machine be very powerful; it is most perfect when procured by presenting a flat imperfect conductor, as a piece of wood or paper.

(4.) Whilst a current of sparks is passing between a large ball and the conductor, present, at the distance of about an inch and a half, a sharp point at double that distance, and the sparks will immediately cease, the electric matter being silently drawn off by the point.

110. The brilliancy of the electric spark is always in proportion to the conducting power of the bodies between which it passes; hence metals are almost exclusively employed for this purpose, as wood and other imperfect conductors produce only faint red streams; yet these substances act as points with some efficacy, and the particles of dust which collect around the apparatus are often troublesome to electricians from the same cause.

111. The nature and density of the medium through which the electric spark passes has also a powerful influence on its character. Dr. Watson seems to have been the first who made experiments on this subject; these he conducted on a very large scale, and he describes the results as having been very beautiful; they will be noticed in another part of this article.

112. The following is a description of the simple apparatus used by Mr. Singer for showing the effect of different gaseous mediums on the passage of electricity. It consists of a glass globe, fig. 1, plate II., of about four inches diameter, having two necks capped with brass; to one of the necks a stop-cock is screwed, with a wire and ball projecting into the globe; another

ball is attached to a wire that slides through a collar of leathers screwed to the opposite cap, so that the balls may be set at any required distance from each other within the globe. This apparatus may be exhausted by connecting the stop-cock with an air-pump, and various gases may be introduced into it, or the air it contains may be rarefied or condensed, and the effect of these processes on the form of the spark examined. In condensed air the light is white and brilliant; in rarefied air, divided and faint; and in highly rarefied air, of a dilute red or purple color. The effect of gases seems to be proportioned to their density; in carbonic acid gas the spark is white and vivid, in hydrogen gas it is red and faint.

113. The brilliancy of the electric spark seems to be in proportion to the density of the medium through which it is made to pass. This is proved by the following experiments:—1. Fix with cement a short iron or platina wire within one end of a glass tube thirty inches long, so that the wire may project a little way within the tube, and fix a small brass ball on the outer extremity of the wire. Fill the tube with mercury, and at the open end place a drop of ether, which secure by the point of the finger while the tube is inverted in a vessel of mercury, so as to form a Torricellian vacuum in the upper part. The ether will rise to the top; and upon the removal of the finger, and the fall of the mercury, will expand into vapor. If now electricity be transmitted through this vapor, it will be rendered luminous, and assume various hues according to its strength. When the spark is strong, and has to pass through some inches of the expanded vapor, the light is usually of a beautiful green color. 2. Take an air-pump receiver twelve or fourteen inches high, and six or seven inches in diameter; adapt a wire, pointed at its lower extremity, to the top of the receiver, letting the point project about two inches into its inside; place the receiver on the plate of the air-pump, and electrify the wire at its top positively; whilst the air remains in the receiver, a brush of light of very limited size only will be seen, but in proportion as the air is withdrawn by the action of the pump it will enlarge, varying its appearance and becoming more diffused as the air becomes more rarefied; until at length the whole of the receiver is filled by a beautiful blush of light, changing its color with the intensity of the transmitted electricity. 3. Into a piece of soft deal about three inches long and an inch and a half square, insert two pointed wires obliquely into its surface at nearly an inch and a half distance from each other, and to the depth of an eighth of an inch; the wires should incline in opposite directions, and the track between the points be in that of the fibres; a spark in passing from one point to another through the wood will assume different colors in proportion as it passes more or less below the surface; and by inserting one point lower than the other, so that the spark may pass obliquely through different depths, all the prismatic colors may be made to appear at once. Sparks taken through balls of wood or ivory appear of a crimson color; those from the surface of silvered leather are of a bright green; a long spark taken over powdered charcoal is yellow; and the sparks from imperfect conductors have a purple hue. The quantity of air through which these sparks are seen also influences their appearance; for the green spark in the vapor of ether appears white when the eye is placed close to the tube, and reddish when it is viewed from a considerable distance.

114. When metallic conductors are of sufficient size and perfectly continuous, they transmit electricity without any luminous appearance; but if the continuity be interrupted in the slightest degree a luminous effect is produced, a bright spark occurring at every separation. Various articles of apparatus are used for the exhibition of this effect, according to the fancy of the operator; the following are those used in general by public lecturers:—1. The spiral tube: this instrument is represented by fig. 2, and is composed of two glass tubes C D, one within another, and closed with two knobbed brass caps A and B. The innermost of these has a spiral row of small round pieces of tin-foil stuck upon its outside surface, and lying at about one-thirtieth of an inch from each other. If this instrument be held by one of the extremities, and its other extremity be presented to the prime conductor, every spark that it receives from the prime conductor will cause small sparks to appear between all the round pieces of tin-foil stuck upon the innermost tube; which in the dark affords a beautiful spectacle, the tube appearing encompassed by a spiral line of fire. Fig. 3 represents several spiral tubes placed round a board, in the middle of which is screwed a glass pillar, and on the top of this pillar is cemented a brass cap with a fine steel point. In this a brass wire turns, having a brass ball at each end, nicely balanced on the wire. To make use of this apparatus, place the middle of the turning wire under a ball proceeding from the conductor, so that it may receive a succession of sparks from the ball; then push the wire gently round; and the balls in their relative motions will give a spark to each tube, and thereby illuminate them down to the board, which from its brilliancy and rapid motion, affords a most beautiful and pleasing sight. Fig. 4 is another instrument for showing the same effect in a diversified form: the action being in this case the same as in the preceding, no further explanation is necessary. The beauty of this kind of exhibition is sometimes much increased by laying down the devices on glass stained of different colors. There are other methods of rendering the electric fluid visible in a very pleasing manner, some of which we shall here enumerate.

115. The luminous conductor, as represented at fig. 5, consists of a glass tube about eighteen inches long, and four in diameter, to the ends of which are cemented the hollow brass pieces D F, E B, the former having a point, C, for receiving electricity from the electrical machine, while the other has a wire terminating in a ball, G, from which a strong spark may be drawn. From each piece a knobbed wire proceeds within the cavity of the glass tube. One of these brass pieces is composed of two parts, in one of which is a valve covering a hole by

which the tube may be exhausted of its air. The whole is supported on two glass pillars fixed in a wooden frame. When this tube is exhausted of its air, and the point C set near the machine, this point will appear illuminated with a star, while the glass tube will exhibit a weak light on its inside; and, from the knobs within the glass, the appearance of positive and negative light will be evident, as the knob at D will show a bright pencil of rays, and the opposite knob a round star. If the point C, instead of being presented to the cylinder, or the positive conductor, be placed near the rubber or negative conductor, the appearance of the light from the internal knobs will be reversed.

116. The visible electrical atmosphere is exhibited by the apparatus represented at fig. 6, where G I represents the receiver with the plate of an air-pump. In the middle of the plate I F a short rod is fixed, having at its top a ball B, whose diameter is nearly two inches. From the top of the receiver another rod A D with a like ball A proceeds, and is cemented air-tight into the neck C; the distance of the balls from one another being about four inches. If, when the receiver is exhausted of air, the ball A be electrified positively, by touching the top D of the rod A D with the prime conductor, or an excited glass tube, a lucid atmosphere appears about it, which, although it consists of a feeble light, is yet very conspicuous, and very well defined; at the same time the ball B has not the least light. The atmosphere does not exist all round the ball A, but reaches from about the lower half of it. If the rod, with the ball A, be electrified negatively, then a lucid atmosphere, like the above described, will appear upon the ball B, reaching from its middle to a small distance beyond that side of it that is towards the ball A; at the same time the negatively electrified ball A remains without any light.

117. Fig. 7 represents a mahogany stand, so constructed as to hold three eggs at a greater or smaller distance, according to the position of the sliding pieces. A chain C is placed at the bottom, in such a manner as to touch the bottom of the egg at B with one end, and with its other the outside coating of a charged jar. The sliding wire A at the top is made to touch the upper egg; and the distance of the eggs asunder should not exceed a quarter or the eighth part of an inch. The electric spark, being made to pass down by means of the discharging rod through the wire and ball at A, will, in a darkened room, render the eggs very luminous.

### Accumulation of Electricity.

118. Although the electricity we have already described be sufficient for the performance of many very fine experiments, and for enabling us to investigate the nature and properties of the electric fluid; yet the full energy of this wonderful agent can only be displayed when it is collected in great quantities, and made to operate on substances in a strongly concentrated state. This, it might be supposed, would be best effected by diffusing the electrical matter over very extensive conductors, and at once discharging the quantity thus accumulated, on the subject of experiment: but such is not the case, since the extension of the surface of any conducting body diminishes its intensity. This fact is admirably illustrated by Mr. Singer in the following experiment.

119. Insulate a flat metal plate with smooth rounded edges, and connect with it a pith-ball electrometer; electrify the plate, and the balls will diverge: bring a similar plate uninsulated near that which is electrified, keeping their flat surfaces parallel and opposite to each other; the balls of the electrometer gradually collapse as the plates approach, and, when they are within about half an inch of each other, the insulated plate appears unelectrified; but, on the removal of the uninsulated plate, the original divergence is restored. See fig. 8.

120. When the insulated conductor, he adds, is electrified, its pith-balls separate, because they are in a different electrical state to the air by which they are surrounded, the fluid of which they attract; but all unelectrified bodies have the same relation to the electrified balls like the ambient air, and such as are conductors and connected with the ground present a more ample source of matter and electricity; consequently, if such bodies are brought near the electrified conductor, its attraction is exerted on them, and the influence of the surrounding air is proportionally diminished; and if the proximity be sufficient, the attraction of the electrified surface will be so exclusively exerted in that direction as to be imperceptible in any other.

121. In the above experiment the bodies are not brought in contact, but only near each other, and consequently there is no communication or loss of electricity, but merely a compensation of its attractive power; hence, when the uninsulated plate is removed, the divergence of the electrometer is restored.

122. The grand instrument used by electricians for the accumulation of electricity is denominated the Leyden jar, or phial: its construction has already been in some measure described, but it may be necessary still further to explain it, and to make some remarks on the principle of its action.

123. *The Leyden Jar* in whatever form it may be constructed is nothing more than an electric placed between two non-electrics. The following description of this remarkable instrument is from Mr. Cavallo's treatise on electricity. If, says he, to one side of an electric, sufficiently thin, as for instance a pane of glass, a piece of sealing-wax, &c., be communicated one electricity, and to the opposite side the contrary, that plate in that case is said to be charged; and the two electricities can never come together except a communication of conducting substances be made between both sides, or the electric be broken by the power of electric attraction. When the two electricities of a charged electric are by any means united, and therefore their power destroyed, that electric is then said to be discharged and the act of union of these two opposite powers is called the electric discharge.

124. To avoid the difficulty of communicating electricity to an electric plate, it is customary to coat the sides of it with some conducting sub-

stance, as tin-foil, gilt paper, &c., by which means the charging and discharging becomes very easy; for when the electricity is communicated to one part of the coating, it is immediately spread through all the parts of the electric that are in contact with that coating; and, when the electric is to be discharged, it is sufficient to make a conducting communication between the coatings of both sides, to discharge entirely the electricities of that electric.

125. When plates of glass are thus coated, it is of essential importance that the glass should extend two or three inches beyond the metal coatings; for, although they do not absolutely touch one another, yet, when they are electrified, the electricity will easily force a passage through the air, and by passing over the surface of the electric, from one coating to the other, render it incapable of receiving any charge.

126. If a glass plate be properly coated on both sides with a conducting substance, and if to one of these coatings be communicated some electricity, the other coating, while communicating with the earth, or with other conducting bodies, acquires by itself an equal quantity of the contrary electricity; but if, while one side is acquiring electricity, the opposite side does not communicate with the earth, or the conducting substances, the glass cannot be charged. The reason of this is founded on the property of bodies to acquire an electricity, contrary to that possessed by a contiguous electrified body; and the cause that hinders these two electricities from mixing, is the interposition of the glass plate which is impermeable to electricity. Although if the glass be too thin, or the charge too high, the strong attraction, between the positive and negative electricities, forces a passage through the glass and discharges it.

127. The most usual, and by far the most convenient form of the Leyden jar is that represented at fig. 9. It is coated on the inside and also on the outside with tin-foil to within two inches and a half of the top. With the inside coating a wire is connected which rises through a lid of baked wood neatly fitted into the mouth of the jar, and terminating in a smooth brass ball. The uncoated part of the jar must be kept perfectly clean and dry, otherwise the action will be very incomplete. The coating is best fastened on with very strong gum water, but some electricians use common paste; and in some instances the tin-foil is first pasted upon paper, and afterwards on the glass: this is considered an improvement both as it respects the facility of drying the gum or paste, and also the strengthening of the jar.

128. If a jar thus constructed be held in one hand by the lower part, and the knob applied to the prime conductor when the machine is in action, it will become charged in a few seconds; and if then a communication be formed between its outside and inside coatings, by touching the ball with the other hand, a smart explosion takes place, and a peculiar and painful sensation is felt chiefly at the wrists and elbows, and across the breast: this sensation is called the electric shock, and it may be communicated to any number of individuals, holding each other by the hand and forming the line of communication between the coatings of the jar. In this way the abbé Nollet succeeded in giving the shock to 180 of the French Guards in the king's presence.

129. When it is wished to discharge the jar without allowing the charge to pass through the body, an instrument is used called the discharging rod, which is composed of a bent wire or two branches, connected by a joint, and furnished with a glass handle. The extremities of the rod or branches are pointed, but have screws, by means of which they are fitted with balls. In discharging a jar with this instrument, it is held by the glass handle, and, while one end is applied to the outer coating of the jar, the other is made to approach the ball of its wire, and thus the electricity passes through the metallic part of the discharger from the one coating to the other of the jar. If the extremities be without their balls the discharge is effected without noise, but otherwise there takes place an explosion, more or less loud according as the jar is more or less charged. The neatest form of the discharging rod is that represented at fig. 10; where AA is the glass handle by which it is held, and BC are the two branches with their balls.

130. When the accumulation of great quantities of electricity is required, the instrument then made use of is termed the electrical battery, and is composed of a number of Leyden jars connected together and placed in an appropriate box. The most modern construction of the battery, is represented at fig. 11. It consists of twelve jars placed in a mahogany box, the bottom of which is covered with tin-foil, for the purpose of connecting together all the outside coatings; the inside coatings being connected together by the wires and balls that rise from their centres, and are united together at the top. On one side of the box there is a small brass hook A for the purpose of connecting the battery by means of a chain with any substance through which the discharge is to be made; this hook passes through the box and is fixed in contact with the tin-foil which connects the exterior coating of the jars.

131. A battery may also be constructed by a combination of panes of glass properly coated. Dr. Franklin formed a battery of this kind with eleven panes of common window-glass, and with it he made the greater part of his experiments.

132. In whatever form batteries are constructed they are charged and discharged in the same manner as a single jar. If one of the knobs of the battery communicate with the prime conductor of the machine in a state of action, it will soon be charged; and the discharge may be effected by making a communication between the coatings, by means of a discharging rod, or any other conductor.

133. Batteries of great size have been constructed by different electricians, so as to accumulate an enormous quantity of electricity, capable of melting the hardest metals, and of putting an instantaneous termination to animal life. Dr. Priestley constructed a battery consisting of sixty-four jars, and containing thirty-two square feet of coated surface. Mr. Cuthbertson completed, in 1784, for the Teylerian Museum at Haarlem, a battery of 135 jars and 132 feet

of coated surface; and in 1789 he completed another battery for the same institution, consisting of 100 jars, and containing 550 feet of coated surface.

134. It is of the utmost importance that a practical electrician should be expert in constructing batteries, and in coating jars himself, not only because of the expense attending the employment of others, but because they may often be at too great a distance from workmen who are accustomed to operations of this kind. A difference of opinion exists with respect to the size of the jars and the kind of glass they are to be made of. Fine flint or crystal glass may be used with greater advantage than any other; but the expense becomes a very considerable object, especially as the jars of a battery are very apt to break by the inequality of their strength; for the force of the fluid in a battery is equally distributed among all the bottles, however their capacities may differ. Thus, if we express the quantity of charge which one jar can easily receive by the number 10, we ought not to combine such a jar in a battery with another whose capacity is only 8; because the whole force of electricity expressed by 10 will be directed also against that the quantity of which is only 8; so that the latter will be in danger of being broken. It will be proper, therefore, to compare the jars with one another before putting them together in a battery.

135. Besides the consideration of the absolute capacity which each jar has of receiving a charge, the time which is taken up in charging it must also be attended to; and the jars of a battery ought to be as equal as possible in this respect as well as in the former. The thinner a glass is, the more readily it receives a charge, and vice versa; but it does not follow that, on account of its thickness, it is capable of containing a greater charge than a thicker one. The reverse is actually the case: and though a thick glass cannot be charged so quickly as a thin one, it is nevertheless capable of containing a greater power of electricity. If the thickness of the glass be very great, no charge can, indeed, be given it; but experiments have not yet determined how great the thickness must be which will prevent any charge. Indeed it is a fact, that, though a thick glass cannot be charged by a weak electric machine, it may be so by a more powerful one; whence it seems reasonable to suppose, that there is no real limit of this kind; but that if machines could be made sufficiently powerful, glasses of any thickness might be charged.

136. The expense of constructing large batteries is an object of great importance, and has led some electricians to devise a cheaper method of making them than is commonly used. Among those who have thus labored must be mentioned Mr. Brooke of Norwich, who introduced batteries of green glass bottles, instead of flint glass jars. Some of them consisted of nine bottles; but when a greater power was required more were added. Jars would have been preferred to bottles, on account of their being more easily coated; but, being less easily procured, he was content to put up with this inconvenience. The mean size of these bottles was about eight inches in diameter; they were coated ten inches high, and made of the thickest and strongest glass that could be procured, weighing from five pounds and a half to seven pounds each. In the construction of a battery of twenty-seven bottles, he disposed of them in three rows; nine of the stoutest and best composing the first row, nine of the next best being disposed in the second, and the third containing the nine weakest. These were all of green glass, but not of the same kind. Some of those in the front row were composed of a glass like that of which Frontigniac wine bottles are made; and this kind of glass seemed to be by much the best, as being both harder and stronger, and less liable to break by a high charge. The second and third rows of the battery consisted of bottles the diameter of which was from six and a half to ten inches, and which were coated from eight and a half to eleven inches high; none of their mouths being larger than an inch and a half, nor less than three quarters of an inch. The bottles of which Mr. Morgan made use were not coated all over the surface usually coated, but slips of tin-foil were laid on of about three quarters of an inch in breadth, at the distance of about a slip between each: a circumstance which clearly shows that a perfectly continuous coating is not of essential importance.

137. We have already noticed that the uncoated intervals of the Leyden jar should be clean and dry; but this must be understood with some limitation, as if it be perfectly clean and so dry as to approach to warmness, an explosion will take place between the coatings over the glass, and thus occasion a loss of the charge with a great waste of time. These effects may be prevented by breathing on the glass through a piece of barometer tube, but much more effectually by pasting a slip of writing paper, an inch broad, on the inner surface of the jar, close to the upper edge of the coating. By this means the intensity of the charge is diminished at the very spot where its tendency to explode is the greatest. The breadth, however, of this rim of paper must be proportioned to the size of the jar. Some prefer varnishing the uncoated part of the jar, in which case the varnish must be of the very finest quality.

138. The precarious process of charging very large batteries to a high degree of intensity is well known to those who have had to make very powerful experiments with them; and, as frequent fractures of jars take place, it may be of importance to the practical electrician to know how to repair them when they are but slightly injured; although, at the same time, we would rather persuade him to substitute a new jar than to undergo the very troublesome and expensive process of repairing, by cement, one that has been burst.

139. The following is the method adopted by Mr. Brooke for repairing the bottles of his battery when they become injured. Take, he says, of Spanish white eight ounces; heat it very hot in an iron ladle, to evaporate all the moisture; and when cool sift it through a lawn sieve; take three ounces of pitch, three quarters of an ounce of resin, and half an ounce of bees'-wax; heat them all together over a gentle fire, stirring the whole

frequently for nearly an hour; then take it off the fire, and continue the stirring till it is cold and fit for use.

140. To the above account of the electrical battery we shall here add Mr. Morgan's rules for its construction. They are the following.

141. Its connecting wires should be perfectly free from all points and edges.

142. They should be easily moveable, so that when accident has lessened the number of jars, the number of wires may be reduced so as to correspond with the remaining quantity of glass.

143. The jars should not be crowded; for in such a case, if necessity should oblige us to employ jars of different heights or sizes, the tin-foil of the higher ones, being in contact with the uncoated glass of the lower ones, the insulation will thus be rendered less complete.

144. The size of the jars should not be large; for though an increase of magnitude lessens the trouble of cleaning the battery, it at the same time increases the expense of repairing damages which frequently occur.

145. The several wires should be fixed very steadily, or in such a manner as not to admit of any shaking.

146. The battery should take up the least possible room; for as it increases in size, so is the probability increased of its being exposed to the influence of surrounding conductors.

147. The strength of the charge that can be produced by either a single jar or a battery is estimated according to the number of square feet of coated surface in each. Hence arises the necessity of forming a combination of jars, as single ones of convenient size cannot be obtained. One of the largest, perhaps, ever constructed was used by Mr. Singer in his lectures on electricity. This jar, he informs us, was eighteen inches in diameter, and two feet in height; its external coating exposing a surface of about six square feet. The principal experiments performed by the aid of the electrical battery will be explained in another part of this article.

### Instruments for Measuring Electricity.

148. The instruments used for the purpose of ascertaining the presence of electricity, and measuring its intensity, are denominated electrometers, and hold a very important place among the necessary articles of electrical apparatus. Some of these are so constructed as to be of use only in indicating the presence of electricity; others perform the two-fold office of showing its presence, and indicating the precise degree of its intensity at the same instant; while others are constructed for the purpose of exactly measuring the strength of, and giving the required direction to any accumulation of the electric matter, from the charge of a small phial to that of the most powerful battery. We shall here give a very brief description of the principal of these useful instruments.

149. The first electrometer is generally allowed to have been that of the abbé Nollet; it was composed of two silk threads, which were made to recede from each other on being approached by an electrified body. The angle of the divergency of the threads was observed by the shadow which they cast on a flat surface placed behind them. This was certainly a very simple apparatus, though, at the same time, very imperfect: it was improved by Mr. Waitz, who appended small weights to the threads.

150. The electrometer of Mr. Canton consisted of a pair of small pith-balls suspended by very fine flaxen threads from a peg enclosed in a small box having a sliding cover fitted to it; when he used this instrument the lid was drawn off, the box held horizontally, so that the balls might hang freely. A more complicated instrument, but founded on the same simple principles, and containing four electrometers, is represented in fig. 12. A is the basis of the stand which supports these, and is made of mahogany. B is a pillar of wax, glass, or baked wood. To the top of the pillar, if it be of wax or glass, a circular piece of wood, C, is fixed; but if the pillar be of baked wood, that may constitute the whole. From this circular piece of wood proceed four arms of glass, or baked wood, suspending at their ends four electrometers, two of which, D, E, are silk threads about eight inches long, suspending each a small downy feather at its end. The other two electrometers, F, G, are made of very small balls of cork, or of the pith of elder; and they are constructed in the following manner:—*a b* is a rod of glass about six inches long, covered with sealing-wax, and formed at top into a ring: from the lower extremity of this stick proceed two fine linen threads, *c c*, about five inches long, each suspending a cork or pith-ball *d*, about one-eighth of an inch in diameter. These threads should be moistened with a weak solution of salt. When this electrometer is not electrified, the threads *c c* hang parallel to each other, and the cork balls are in contact; but when electrified they repel one another, as represented in the figure. When it is inconvenient to use the insulating stand, A B, the electrometers may be easily supported by a glass rod or tube.

151. Electrometers constructed of pith of elder were employed by Mr. Cavallo in many of his experiments in electricity, particularly in those on the electricity of the atmosphere. One of these instruments is represented in figs. 13 and 14. The case or handle of this instrument is formed of a glass tube, about three inches in length, and three-tenths of an inch in diameter, one-half of which is coated with wax on the outside. From one extremity of this tube, viz. that without sealing-wax, a small loop of silk proceeds, which occasionally serves to hang the electrometer on a pin, &c. To the other extremity of the tube a cork is adapted, which, being cut tapering on both ends, can fit the mouth of the tube with either end. From one extremity of this cork two linen threads proceed, a little shorter than the length of the tube, suspending each a little cone of pith of elder. When this electrometer is to be used, that end of the cork which is opposite to the threads is pushed into the mouth of the tube; the tube then forms the insulated handle of the pith electrometer, as represented in fig. 13. But when the electrometer is to be carried in the pocket, the threads are put into the tube, and the cork stops it, as repre-

sented in fig. 14. The advantages of this electrometer are, its convenient small size, its great sensibility, and its continuing longer in good order than any other. Fig. 15 represents a case to carry the above described electrometer in. This case is like a common toothpick-case, except that it has a piece of amber fixed on the extremity A, which may occasionally serve to electrify the electrometer negatively; and on the other extremity a piece of ivory fastened upon a piece of amber B C. This amber serves only to insulate the ivory; which, when insulated, and rubbed against woollen cloths, acquires a positive electricity, and is therefore useful to electrify the electrometer positively.

152. Another form of the pith-ball electrometer is that invented by Mr. Henley; it is simple in its construction, and extremely useful in numerous experiments, as will afterwards appear. It consists (fig. 16) of a perpendicular stem formed at top like a ball, and furnished at its lower end with a brass ferrule and pin, by which it may be fixed in one of the holes of the conductor, or at the top of a Leyden jar. To the upper part of the stem, a graduated ivory semicircle is fixed, about the middle of which is a brass arm or cock, to support the axis of the index. The index consists of a very slender rod, which reaches from the centre of the graduated arch to the brass ferrule; and to its lower extremity is fastened a small pith-ball nicely turned in a lathe. When this electrometer is in a perpendicular position, and not electrified, the index hangs parallel to the pillar; but when it is electrified the index recedes more or less according to the quantity of electricity, from the stem. Fig. 17, represents this electrometer separated from its stand, and fixed upon the prime conductor. The scale in Mr. Henley's quadrant is divided into equal parts; but M. Achard has shown that, when this is the case, the angle at which the index is held suspended by the electric repulsion is not a true measure of the repulsive force; to estimate this force truly, he demonstrates that the arc of the electrometer should be divided according to a scale of arcs, the tangents of which are in arithmetical progression.

153. One of the most useful electrometers for indicating the presence of very small portions of electricity, is that invented by the Rev. Mr. Bennet. The common construction of this instrument is very good; but a highly improved form of it is described by Dr. Brewster in the appendix to his new edition of Ferguson's Essays. The chief difference between this and the original construction consists in the cap and stand being of brass instead of wood. He thus describes it:—

It consists of two stripes of gold leaf, *m*, *n*, suspended within a glass cylinder A B E D. This cylinder has a brass cap A B, a little broader than itself, in the centre of which is a hole, *a*, in the inside of the cap, which receives a small wedge of wood. On each side of this wedge, two equal stripes of gold leaf, free of all roughness at their edges, are fixed by a little varnish; these stripes are generally about two inches long, and about a quarter of an inch broad. The inside of the cap A B, and the upper part of the glass cylinder, are coated with sealing-wax. On the inside of the glass cylinder are pasted two slips of tin-foil, *b*, *c*, diametrically opposite to each other, and rising higher than the stripes of gold leaf. The lower ends of the tin-foil are in contact with the brass stand D E F, which supports the whole. For observing the electricity of the atmosphere, a pointed wire, C, is inserted in the brass cap A B. To use the electrometer, turn round the cap A B, till the surfaces of the gold leaf are parallel to the surfaces of the pieces of tin-foil *b*, *c*, so that the two stripes of gold leaf may hang in contact in the middle of the cylinder. Then, if a body containing a small quantity of electricity, be brought in contact with the cap A B, the gold leaves, *m*, *n*, will diverge, and their extremities will strike the slips of tin-foil *b*, *c*, and thus convey the electricity to the ground. See figs. 1 and 2, plate III.

154. There have been other improvements proposed on this electrometer, one of which was by Mr. Singer, and chiefly respects the mode of insulation. This instrument is represented in fig. 3: the following brief description of it will suffice to convey a correct idea of it. Like the preceding it is constructed with a glass cylinder, surmounted by a broad cap of either wood or metal. The insulation depends on a glass tube of four inches long, and one-fourth of an inch diameter, covered on both sides with sealing-wax, and having a brass wire of a sixteenth or twelfth of an inch thick, and five inches long, passing through its axis, so as to be perfectly free from contact with any part of the tube, in the middle of which it is fixed by a plug of silk, which keeps it in a concentric position with the internal diameter of the tube. A brass cap is screwed upon the upper part of this wire; it serves to limit the atmosphere from free contact with the outside of the tube, and at the same time to defend its inside from dust. To the lower part of the wire the gold leaves are fastened. The glass tube passes through the centre of the cap of the electrometer, and is cemented there about the middle of its length. When this construction is considered, it will be evident that the insulation of the wire, and also of the gold leaves, will be preserved until the inside as well as the outside of the glass tube become coated with moisture; but so effectually does the arrangement preclude this, that some of these electrometers have remained for seven years without being either warmed or wiped, and have still appeared to retain the same insulating power as at first. No. 2 shows this electrometer complete.

155. An electrometer of common use in the administration of medical electricity, sometimes attached to the Leyden jar, and sometimes made to fit into one of the ends of the prime conductor, is termed Lane's electrometer. Fig. 4 is a representation of this electrometer: it consists of two brass balls of equal size, one of which is connected with the inside coating of the jar, and the other insulated opposite to the first, yet so as to admit of its being placed in contact with it, or at any required distance from it. That which is insulated is connected by a wire with the outer coating of the jar, so as to serve as a course for the discharge which, it is very obvious from an inspection of the figure, will take place sooner or

later, according as the balls are placed either nearer to, or farther from, each other. But before we proceed to notice the *discharging* electrometer, we must describe one or two others which are both ingenious and useful.

156. We have described Mr. Cavallo's pocket electrometer at No. 154, but this gentleman constructed another portable electrometer for atmospherical purposes, which deserves particular notice. Its principal part consists of a glass tube C D M N, fig. 5, cemented at the bottom into the brass piece A B, by which part the instrument is to be held when used for the atmosphere; it also serves to screw the instrument into its brass case, A C, fig. 6. The upper part of the tube, C D M N, is tapered to a small extremity, which is entirely covered with sealing-wax; to this tapering part a small tube is cemented; the lower extremity being also covered with sealing-wax, projects a short way within the tube C D M N; into this smaller tube a wire is cemented, which with its under extremity touches the flat piece of ivory H, fastened to the tube by means of a cork; the upper extremity of the wire projects about a quarter of an inch above the tube, and screws into the brass cap E F, which cap is open at the bottom, and serves to defend the waxed part of the instrument from the rain, &c.

157. A section of the brass cap is represented in fig. 7, to show its internal structure, with the manner in which it is screwed to the wire projecting above the small tube L. This small tube and the upper extremity of the large tube, C D M N, appear like one continued piece when joined, from the sealing-wax covering them both. The conical corks, P, fig. 5, which show the electricity by their repulsion, are made very small, and suspended by very fine silver wires, shaped like rings at the top, by which they hang very loosely on the flat piece of ivory H, which has two holes in it. By this method of suspension, which Mr. Cavallo says is applicable to every sort of electrometer, the friction is reduced *to almost nothing, and the instrument is thus rendered sensible to a very small degree of electricity. I M and K N are two narrow slips of tin-foil, fixed on the inside of the glass C D M N,* and communicating with the brass bottom A B. They serve to convey that electricity which, when the balls touch the glass, is communicated to it, and, being accumulated, might disturb the free motion of the balls.

158. To use this instrument for artificial electricity, affect the brass cap E F, by an electrified substance, and the divergence or convergence of the balls of the electrometer, at the approach of an excited electric, will show the quality of the electricity. The best manner to electrify this instrument is, to bring excited wax so near the cap, that one or both of the corks may touch the side of the bottle C D M N, after which they will soon collapse and appear unelectrified. On removing the wax, they will again diverge, and remain electrified positively.

159. To try the electricity of the fogs, air, clouds, &c., by this electrometer, the electrician must unscrew it from its case, and hold it by the bottom A B, to present it to the air a little above his head, so that he may conveniently see the balls P, which will immediately diverge if there is any electricity; i.e. whether positive or negative may be ascertained, by bringing an excited piece of sealing-wax, or other electric, towards the cap E F.

160. M. Saussure has made an improvement in this electrometer. The principal circumstances in which his electrometer differs from Mr. Cavallo's, are: The fine wires, by which the balls are suspended, should not be so long as to reach the tin-foil which is pasted on the inside of the glass; because the electricity, when strong will cause them to touch this tin-foil twice consecutively, and thus deprive them in a moment of this electricity. To prevent this defect, and yet give them a sufficient degree of motion, it is necessary to use larger glasses than those that are generally applied to Mr. Cavallo's electrometer two or three inches diameter will answer the purpose very well. But, as it is necessary to carry off the electricity, which may be communicated to the inside of the glass, and may thus be confounded with that which belongs to those substances that are under examination, four pieces of tin-foil should be pasted on the inside of the glass; the balls should not be more than $\frac{1}{20}$ of an inch diameter, suspended by silver wires, moving freely in holes nicely rounded. The bottom of the electrometer should be of brass; for this renders it more easy to deprive them of any acquired electricity, by touching the bottom and top at the same time.

161. This electrometer may be used instead of the condenser of M. Volta, by only placing it on a piece of oiled silk, a little larger than the base of the instrument: but in this case the base and not the top, of the instrument must be brought in contact with the substance, the electricity of which is to be explored. By this instrument it is easy to ascertain the degree of conducting power in any substance. If it is placed on an imperfect conductor, as dry wood or marble, and if the instrument is electrified *strongly, and afterwards the top is touched, the electricity will appear to be destroyed; but, on lifting up the instrument by the top, the balls will again diverge,* because the imperfect conductor formed with the base a kind of electrophorus, by which the electric fluid was condensed, and lost its tension, till the perfect conductor was separated from the imperfect one; whereas, if the conductor had been more perfect, it would have been deprived of its electricity immediately on the application of the hand. It is useful to discover also the electricity of any substance, as of clothes, hair of different animals, &c. For this purpose it must be held by the base, and the substance rubbed briskly (only once) by the base of the electrometer; the kind of electricity may be ascertained in the usual manner. But as the top of the electrometer acts, in this case, as an insulated rubber, the electricity it acquires is always contrary to that of the rubbed body.

162. To collect a great quantity of electricity from the air, this electrometer is furnished with a pointed wire from fifteen inches to two feet long, which unscrews in three or four pieces, to render the instrument more portable, see fig. 8

When it rains or snows, the small cover, fig. 9, is to be screwed on the top of the instrument, as by this its insulation is preserved. This indicates not only the electricity of fogs, but also that of serene weather, and enables the observer to discover the kind of electricity which reigns in the atmosphere; and, in some degree, to form an estimate of its quantity, and that under two different points of view, the degree of intensity, and the distance from the earth at which it first begins to be sensible. A conductor exhibits signs of electricity only when the electric fluid is more or less condensed in the air than in the earth. Though the air resists the passage of the electric fluid, it is not absolutely impermeable to it; it suffers it to pass gradually, and generally with more ease in proportion as its mass is less. It is, therefore, interesting to discover at what height it is necessary to be elevated, in order to find a sensible difference between the electricity of the earth and that of the air.

163. Mr. Brooke of Norwich constructed an electrometer of a very ingenious description, and certainly valuable in its application, of which he has given a full account in his Miscellaneous Experiments; the limits, however, within which our article must be confined, will not allow of our giving his lengthened description of the instrument. We shall, therefore, present our readers with a short account of another electrometer, the invention of professor Robison of Edinburgh, which in our opinion is, in its chief essentials, much superior to that of Mr. Brooke. This beautiful and delicate instrument is represented by fig. 10, where A, a finely polished brass ball of a quarter of an inch diameter, is fixed on the point of a common sewing needle about three inches long, and as slender as can be procured of that length. On the other end of the needle is fixed a ball of amber, glass, or other non-conducting substance, of about ½ or ⅗ths of an inch in diameter. This ball is so fixed as that the needle does not quite reach to its surface, though the ball F must be completely perforated. From the electric ball there passes a slender glass rod, F, E, L, bent at right angles at E, so that *the part F E may be about three inches long, and the other extremity L, immediately opposite to* the centre of the ball A. A piece of amber C, so cut as to have two parallel cheeks, is fixed on the extremity L of the glass rod. For the principal part of the instrument, a strong dry silk thread is to be prepared by dipping it perpendicularly in melted sealing-wax, till it be fully penetrated by the wax, so as to retain a thin coating of it.

164. The thread, thus coated, must be kept extended, so that it may be quite straight; it must be made perfectly smooth by holding it before a fire, and rolling it on a smooth table. It is then to be passed through a small cube of amber, that has two holes drilled in two of its opposite faces, perpendicularly to the stalk. By these holes the cube is suspended, so as to move readily, on two fine brass pins, between the cheeks of the piece of amber at L. The waxed thread is about six inches long, and is equally divided by the amber cube. To the end B is fixed a ball of some conducting substance, as of polished metal, or gilt cork, a quarter of an inch in diameter. The other extremity D passes through a cork ball, so as to move with a slight friction.

165. The construction of this part of the electrometer is such that when F E lies perpendicularly to the horizon, and the stalk B D, with its balls, is allowed to hang freely, the ball B just touches the ball A, as represented in fig. 11. The ball F is fixed to one end of a glass rod F I passing perpendicularly through the centre of a graduated circle G H O, and furnished at the opposite extremity I with a knobbed handle of boxwood. H K is the stand of the electrometer, in the head of which is a hole in which the rod F I slides smoothly but not easily. There is also adapted to the glass rod F I an index N H that turns round it. This index is placed so as to be parallel to a line L A drawn through the centre of the ball A. And, as the circle is divided into 360 degrees, 0 being marked above, and 90 on the right hand; the index will point out the angle which the line L A makes with the vertical line. It is convenient to have another index on the rod F I turning with some friction round it, and extending considerably beyond the circle G H O.

166. When this electrometer is used for computing the quantum of electricity belonging to any body, it must be connected by means of a wire with the substance to be examined: the wire must be fixed into the hole of the ball F, which is in part filled by the needle; and indeed it must come in contact with the needle. The index must now be turned round by the handle I until it stand at 90°. In this position C B is horizontal, and the ball B contiguous to A. If in this position the balls B and A are electrified, they do not separate till the index be turned back towards 0. In some part of this space they will separate, and the point must be carefully noted, as this is the measure of their electric power while in contact. By turning still more towards 0, the separation is increased. An assistant must now turn the long index till it be parallel to the other, and consequently to C D. On loading the cork ball D with grain weights till B D be *nicely balanced in a horizontal position, and computing for the proportional length of C B and C D*, we obtain an exact measure in grains of the electric force with which the balls B and A separate in this position.

167. The electrometers already described have all been found highly useful to the practical electrician, according to the peculiar nature of the course of his experiments; but for ascertaining the actual repulsive and attractive powers of very faintly electrified bodies, they are perhaps all excelled by the ingenious invention of M. Coulomb, a French philosopher. The construction of this delicate instrument, which is called the *torsion balance*, will be best understood by a reference to the plate, where we have given a representation of it in its complete state, and of some of its parts on an enlarged scale.

Fig. 1, Plate IV., is a cylinder of flint glass twelve inches in diameter, and twelve in height, covered with a plate of glass, which is made to fit to it by a projecting fillet on the lower surface and having in it four round perforations, of

an inch and three-fourths in diameter, one of which is in the centre *f*, and receives the glass tube *fh*, which is two feet in height, and is fixed in the glass plate with cement. Into the top of this tube is inserted the brass piece H, fig. 2, No. 3, which is perfectly cylindrical, and having a small shoulder which rests on the top of the tube into which it is cemented. This brass piece is made to fit by means of a screw on the hollow cylinder, No. 2, fig. 2, to which is joined the circular plate *ab*, divided into 360 degrees, and having a hole G in its centre for admitting the cylindrical pin *i*, No. 1, fig. 2. This pin is surmounted with a milled head *b*, from which an index *io* projects, having a point turned downwards at *o*, to mark the divisions on *ab*. This pin moves with some friction in the hole G, while the cylinder moves steadily in the brass piece H. To the lower end of the pin there is attached the pincer *q*, resembling the end of a solid port crayon, and capable of being tightened by a sliding ring: so as to seize a fine silver wire, while its lower end is held by a similar pincer, shown by P*o*, fig. 3, and tightened by the sliding ring *r*.

168. The stalk *ro* is cylindrical, and is made so heavy as to keep the wire quite straig[illegible], without breaking it. Fig. 3 exhibits this pincer with the arm *z*C*q* passing through it. The length of this arm is eight inches, and it is formed of a stout silk thread, or a fine round straw coated with wax, or with lac; it is about one-tenth of an inch diameter, and six inches long, and is terminated by two inches of wax drawn out into a fine thread. The end *q* carries a pith-ball *a* turned very smooth, and gilded, and the other end is a small circular plane of paper covered with varnish, and of sufficient weight to counterpoise the pith-ball *a*, which is from one-fourth to one-half of an inch in diameter.

169. Fig. 1 represents the whole of the parts of the instrument in their combined form. The arm is represented as hanging horizontally in the middle of the glass cylinder, so as to admit of its turning freely round its centre, in a circle described on the glass by a graduated slip of paper divided into 360°. When *a* is opposite to *o* on this graduated circle it is contiguous to the ball *b*, which hangs within the cylinder by a silk thread covered with lac, and kept steady by the piece of wood, which is seen lying on the cover, from which it is suspended. Th[illegible]n of the instrument is produced by turning the milled head *b*, which carries the index *io*, called the *twist index*, round until it points to *o* on the graduated circle *ab*, and the whole is then turned in the brass socket H, till the ball *a* stands at O on the graduated paper circle Q. Fig. 4 represents a cylindrical stick of sealing-wax in the one end of which is inserted a fine brass wire terminated by a smooth ball. Fig. 5 is another part of this apparatus shown on an enlarged scale: it consists of a plug of sealing-wax A, which is made to fit tightly into the upper part of the instrument; through this plug of wax a wire *c*, hooked at the top, passes perpendicularly, and terminates in the finely polished metallic ball *d*; its use is to connect the electrometer with other bodies.

170. We shall here add, as an illustration of the method of using this ingenious instrument, an account of Coulomb's method of determining by it the electrical repulsion of the two balls *a* and *b* when electricity was communicated to them. Having electrified the brass pin, fig. 5, it was introduced through the hole *m*, in the top of the cylinder, and made to touch the ball *b*, in contact with the ball *a*, thus communicating its electricity to the two balls, which consequently became electrified with the same electricity; and, on this pin being withdrawn, a mutual repulsion took place between the two balls, *a* being driven from *b* to a distance easily measured on the graduated scale, and obviously regulated by the resistance of the wire to farther torsion. After a few slight oscillations the arm will rest and the degree of repulsion may be accurately noted. The index *io* is now to be turned backwards till the ball *a* come to its former position, by which movement the silver wire will be twisted, and a force produced proportional to the angle of torsion which is required to bring the ball *a* in contact with the ball *b*. By this means M. Coulomb ascertained the distance at which different angles of torsion bring the balls in contact after mutual repulsion; by comparing the forces of torsion with the corresponding distances of the balls, he obtained a measure of their repulsive force.

171. The following are given by Dr. D. Brewster, as the results of some experiments with this curious instrument, by its inventor.

(1.) The two balls being electrified with the head of the pin, and the index of the micrometer being set to zero, the ball *a* was repelled by the ball *b* to the distance of 36°.

(2.) The silver wire being twisted by turning the index of the micrometer 126°, the ball *a* approached to the ball *b*, and stopped at the distance of 18° from it, having moved backwards through an arc of 18°.

(3.) Having again twisted the silver wire through an arc of 567°, the two balls approached, and stopped at the distance of 8° 30′.

172. Now, as the force of torsion, or the force which is capable of keeping a thread twisted to a certain degree, so as to hinder it from turning round its axis, and recovering its natural state, has been shown by Coulomb to be proportional to the angle of torsion, or the arc through which it has been twisted, we have in the first experiment such a force, equal to 36°; and in the second experiment, when the distance of the balls was 18°, the angle, and consequently the force of torsion, was $126° + 18 = 144°$; hence the repulsive force, at the distance of 36°, was 36°: and the repulsive force, at the distance of 18°, was 144°, or quadruple at half the distance. In the third experiment, when the distance of the balls was 8° 30′, the force of torsion was 567°; so that, at a quarter of the distance, the repulsive force was nearly eight times as great. From this it follows, that the repulsive force of two small globes electrified either positively or negatively, is in the inverse ratio of the squares of the distance of the centres of the two globes.

173. In these experiments, the wire P*l* was twenty-eight inches long, and $\frac{1}{16}$ of a grain in weight,

and the force necessary to twist it through an angle of 300°, when at the distance *a* P, was $\frac{1}{130}$ of a grain, as calculated from the formulæ given by M. Coulomb in his Memoir on the force of Torsion. Hence the real forces in the preceding experiments were,

| Distances of the Balls. | Angles and Forces of Torsion. | Absolute Forces in grains. |
|---|---|---|
| 36° | 36 | $\frac{1}{3400}$th of a grain. |
| 18 | 144 | $\frac{1}{850}$ |
| $8\frac{1}{2}$ | 576 | $\frac{1}{212}$ |

174. An electrometer has been constructed by Mr. Cuthbertson, which, we think, in point of real utility, to the practical electrician, is equalled by none with which we are acquainted. Those only who have to go through the operation of melting wires before a public audience, can duly appreciate the value of this incomparable instrument. We have given in fig. 6 a representation of this discharging compound electrometer, as connected with a single jar, which, if it be about six inches in diameter and twelve inches high, will be sufficient to fuse four inches of fine pendulum wire. A description of it may be of use to the inexperienced electrician. The base G H is an oblong square piece of mahogany of about eighteen inches long, and six in breadth: in this are three glass supports, D, E, F, mounted with brass balls, *a*, *b*, *c*. Under the brass ball *a* there is placed a brass hook; the ball *c* is made of two hemispheres, the under one being fixed to the brass mounting, and the upper turned with a groove to shut upon it, so that it may be taken off at pleasure. The ball *b* has a brass tube fixed to it, about three inches long, cemented to the top of F; and a hole at the top, of about half an inch in diameter, corresponding with the inside of the tube. A B is a straight brass wire, with a knife-edged centre in the middle, placed a little below the centre of gravity, and equally balanced with a hollow brass ball at each end, the centre, or axis, resting upon a properly formed piece of brass fixed in the inside of the ball *c*; that side of the hemisphere towards *c* is slit open, to permit the end *c* A of the balance to descend till it touches the ball *a*, and the upper hemisphere C is also so opened to permit the end *c* B to ascend; *i* is a weight of a certain number of grains, and made in the form of a pin with a broad head; the ball B has two holes, one at the top, and the other at the bottom; the upper hole is so wide as to let the head of the pin pass through it, but to stop at the under one, having its shank hanging freely in *b*; several such pins are made to each electrometer of different weights; *k* is a Henley's quadrant electrometer, and when in use it is screwed upon the top of *c*.

175. It is obvious, from the construction, that if the foot stand horizontally, and the ball B be made to touch *b*, it will remain in that position without the help of the weight *i*; and if it should receive a low charge, the two balls *b*, B, will repel each other; B will begin to ascend, and, on account of the centre of gravity being above the centre of motion, the ascension will continue till A rest upon *a*. If the balance be again set horizontally, and a pin *i*, of any small weight, be put into its place in B, it will cause B to rest upon *b*, with a pressure equal to that weight, so that more electricity must be communicated than formerly, before the balls will separate; and, as the weight in B is increased or diminished, a greater or less quantity of electricity will be required to effect a separation.

176. When this instrument is to be used with a jar, or battery, one end of a wire, L, must be inserted into the ball *b*, and the other end into a hole of any ball proceeding from the inside of a battery, or jar, as M; *k* must be screwed upon *c*, with its index towards A; the reason of this instrument being added, is to show, by the index continuing to rise, that the charge of the battery is increasing, because the other part of the electrometer does not act till the battery has received its required charge.

177. It was formerly observed that the uncoated part of a jar might be too dry to admit of its being highly charged: the following experiment will illustrate the truth of this, as well as show the use of the electrometer just described in fusing wires. Every thing being prepared, as represented in the figure, with the jar M annexed to the electrometer, which jar may contain 168 square inches of coating put into B, the pin marked 15, take two inches of watch pendulum wire, fix to each end a pair of small pincers, as is represented at G *m*, hook one end to *m*, and the other to the wire N, communicating with the outside of the jar; let the uncoated part of the jar be made very clean and dry; and let the prime conductor of the machine, or a wire proceeding from it, touch the wire L; if then the machine be put in motion, the jar and electrometer will be charged, as will be seen by the rising of the index *k*, and, when charged high enough, B will be repelled by *b*; A will descend and discharge the jar through the wire, which was confined in the pincers, and the wire will be fused and run into globules.

178. Repeat this experiment with the following variations, viz. instead of two inches of wire take eight; and instead of loading the ball with fifteen, insert the pin weighing thirty grains; charge, as before, and a spontaneous explosion will take place between the coatings of the jar without moving the electrometer, and consequently the wire will remain as it was. But let the uncoated part of the jar be now a little moistened by breathing on it through a glass tube; charge the jar again, the electrometer will operate, the charge pass through the circuit, and the whole length of the wire will appear red-hot, and be instantly fused into globules.

179. A very useful instrument, called the universal discharger, was invented by Mr. Henley. It is shown in fig. 7, and consists of a mahogany base, A A, fourteen inches long, and about four broad. B, B, are two glass pillars, cemented in two holes upon the board A, and furnished at top with brass caps, each of which has a turning joint, and supports a spring tube, through which the wires D, D, slide. Each of the caps is composed of three pieces of brass, connected so that the wires D, D, besides their sliding through the sockets, have a horizontal and vertical motion. Each of the wires, D, D, is furnished with an

open ring at one end, and at the other it has a brass ball, which, by a short spring socket, is slipped upon the pointed extremity, and may be removed. E is a circular piece of wood, having on its surface a slip of ivory, inlaid, and furnished with a foot, which slides into the socket F, in which it is made fast at any required height by the screw S. To this discharger belongs the small press, fig. 8, the stem of which fits into the socket, instead of the circular table E. On the top of the stem are two oblong boards, which are pressed together by means of two screws. Between these boards may be placed any substance which requires to be pressed while the electric fluid is sent through it. The construction of this instrument is such as to enable the operator to use it with advantage in numerous experiments; particularly the oxidation of metallic leaves between slips of card paper, or of glass; splitting small pieces of oak, firing gunpowder, &c.

### Condensers and Doublers of Electricity.

180. Condensers of electricity are instruments used for the detection of very small portions of that matter, portions too minute to be rendered sensible by any of the electrometers which we have yet described. Several very ingenious electricians have employed themselves in the construction of instruments for this purpose: the principal of these contrivances we shall now briefly describe.

181. Volta appears to have been the first who attempted any thing of this description. His condenser of electricity consists of a flat and smooth metal plate, furnished with an insulating handle, and a semi-conducting, or imperfectly insulating, plane. When it is required to examine a weak electricity with this apparatus, as that of the air in calm and hot weather, which is not generally sensible to an electrometer, the operator must place the above-mentioned plate upon the semi-conducting plane, and a wire of some other conducting substance must be connected with the metal plate, and extended in the open air, so as to absorb its electricity; then, after a certain time, the metal plate must be separated from the plane; and, on being presented to an electrometer, it will electrify it much more than if it had not been placed upon the above-mentioned plane.

182. The principle on which the action of this apparatus depends, says Mr. Cavallo, is, that the metal plate, whilst standing contiguous to the semi-conducting plane, will both absorb and retain a much greater quantity of electricity than it can either absorb or retain when separate, its capacity being increased in the former and diminished in the latter case.

182.* This condenser was afterwards improved on by Mr. Cavallo, by employing a small metallic plate, about the size of a shilling, having affixed to it a glass handle covered with sealing-wax. When the larger plate appeared so slightly electrified by the communicated electricity as not to affect the electrometer, he then placed the small plate on the plane and touched it with the edge of the large one, holding the latter in an almost vertical position; the small plate was thus found to indicate a very sensible degree of electricity.

183. One of the most convenient and elegant condensers yet contrived is that of Mr. Cuthbertson. This instrument is shown in fig. 9, and is composed of two metallic plates, *a* and *b*, about six inches in diameter, tightly screwed to two brass balls, but so as that one of them be fixed immoveably to a glass pillar, as *e*, while the other is fastened to a brass pillar *f*, having a hinge at its lower extremity by which it can be moved backwards into the position *g*. When the instrument is used, the electricity to be examined is communicated to the insulated plate *b*, while it is parallel to the uninsulated plate *a*, and after remaining for some time in this position the uninsulated plate is drawn back, and the intensity of the insulated plate, *a*, is shown by being presented to an electrometer in the usual way.

184. A modification of this instrument, called the condensing electrometer, is represented by fig. 10. In this construction the plates are smaller, and the insulated plate is attached to the cap of a gold-leaf electrometer; by this means very small degrees of electricity are discovered, and their intensity shown by the divergence of the gold leaves within the cylinder.

185. A condenser, of a remarkably simple description was proposed by Mr. Singer, and is constructed by placing three small spots of sealing-wax, at equal distances, on the lower face of the cover of an electrophorus, to serve as insulating feet, by which the cover may be supported at the distance of about the twelfth of an inch from the surface of a smooth and even table. If a Leyden jar, he adds, be now charged, and afterwards discharged, so as not to affect an electrometer, and its knob be then placed in contact with the condenser resting on the table for a few seconds, the small residuum of electricity in the jar will be absorbed by the condensing plate; and when this is raised from the table it will affect the electrometer with the same electricity as that with which the jar was charged.

185*. Doublers of electricity are instruments so constructed as that very small quantities of electricity may be continually doubled by them, until, being condensed, they are rendered perceptible by the common electrometer.

186. An instrument of this kind was invented by the Rev. Mr. Bennet, and is represented by fig. 1, plate V. It is formed by the addition of two polished brass plates, with insulating handles, to the common gold-leaf electrometer. The plates are varnished on the lower side, and the insulating handle of one of them, B, is fixed to the side, while that of the other, A, is placed perpendicularly in the centre. Though this apparatus appears to be very simple, it requires a very complex process, and has, therefore, generally given place to what are called moveable or revolving doublers.

187. Revolving doublers appear to have been first introduced by Dr. Darwin, who claims the merit of the invention. Darwin's doubler was moved by a train of wheels, and required to be touched by the hand to place the plates in the requisite positions. This instrument was much improved by Mr. Nicholson; a representation of

it, in its improved form, is given in fig. 2. The whole is supported on a glass pillar six inches and a half high, and consisting of the following parts :—Two fixed plates of brass, A and C, are separately insulated and disposed in the same plane, so that a revolving plate B may pass very near them without touching. Each of these plates is two inches in diameter; they have adjusting pieces behind, which serve to place them correctly in the required position. D is a brass ball on which they turn, of two inches diameter, fixed on the extremity of an axis that carries the plate B. Besides the essential purpose which this ball is intended to answer, it is so loaded within on one side, that it serves as a counterpoise to the revolving plate, and enables the axis to remain at rest in any position.

188. The use of this ingenious instrument will be best understood from the following account of it given by Mr. Nicholson in the Philosophical Transactions :—'When the plates A and B,' says Mr. Nicholson, 'are opposite to each other, the two fixed plates A and C may be considered as one mass; and the revolving plate B, together with the ball D, will then constitute another mass. All the experiments yet made concur to prove that these two masses will not possess the same electric state; but that, with respect to each other, their electricities will be plus and minus. These plates would be simple, and without any compensation, if the masses were remote from each other; but, as that is not the case, a part of the redundant electricity will assume the form of a charge in the opposed plates A and B. From other experiments I find,' says Mr. Nicholson, 'that the effect of the compensation on plates opposed to each other at the distance of one-fortieth part of an inch, is such, that they require to produce a given intensity at least 100 times the quantity of electricity that would have produced it in either, if placed singly and apart.

189. The redundant electricities in the masses under consideration, will therefore be unequally distributed : the plate A will have about ninety-nine parts, and the plate C one; and, for the same reason, the revolving plate B will have ninety-nine parts of the opposite electricity, and the ball D one. The rotation, by destroying the contacts, preserves this unequal distribution, and carries B from A to C, at the same time that the tail K connects the ball with the plate C. In this situation, the electricity in B acts upon that in C, and produces the contrary state, by the communication between C and the ball; which must therefore acquire an electricity of the same kind with that of the revolving plate. But the rotation again destroys the contact, and restores B to its first situation opposite to A.'

190. Here, if we attend to the effect of the whole revolution, we shall find that the electric states of the respective masses have been greatly increased; for the ninety-nine parts in A and in B remain, and the one part of electricity in C has been increased so as nearly to compensate ninety-nine parts of the opposite electricity in the revolving plate B, while the communication produced an equal mutation in the electricity of the ball. A second rotation will of course produce a proportional augmentation of these increased quantities, and a continuance of turning will soon bring the intensities to their maximum, which is limited by an explosion between the plates.'

191. 'If one of the parts be connected with an electrometer, more especially that of Bennet, these effects will be very clearly seen. The spark is usually produced by a number of turns between eleven and twenty; and the electrometer is sensibly acted upon by still fewer. When one of the parts is occasionally connected with the earth, or when the adjustment of the plates is altered, there are some variations in the effects not difficult to be reduced to the general principles, but sufficiently curious to excite the attention of persons the most experienced in this branch of natural philosophy.

192. 'If the ball be connected with the lower part of Bennet's electrometer, and the plate A with the upper part, and any weak electricity be communicated to the electrometer, while the position of the apparatus is such that the cross piece G H touches the two pins, a very few turns will render it perceptible. But here, as in the common doubler, the effect is rendered uncertain by the condition that the communicated electricity must be strong enough to destroy and predominate over any other electricity which the plates may possess. I need scarcely observe, that, if this difficulty should be hereafter removed, the instrument will have great advantages as a multiplier of electricity in the facility of its use, the very speedy manner of its operation, and the unequivocal nature of its results.'

### The Electrophorus.

193. Several of the instruments we have now described appear capable of collecting and imparting small quantities of electricity; but it may be questioned if any of them can be said to do so on a scale comparable with that of the common electrophorus of Volta, which may be said to be a kind of electrical machine. Fig. 3 is a representation of this simple but highly useful article of apparatus, which any person at all skilled in the use of electrical apparatus may construct for himself by attending to the following directions. Procure two circular plates of metal, or of wood covered with tin-foil, and well rounded at the edges; these are the conductors: between them is placed a resinous plate, formed by melting together equal parts of shell-lac, resin, and Venice turpentine, and pouring this mixture, whilst fluid, within a tin hoop of the required size, placed on a marble table, from which the plate may be readily separated when cold. This plate should be half an inch in thickness; it is sometimes made by pouring the mixture on one of the conductors, which is then formed with a rim for that purpose. In the centre of the upper conductor is fixed a glass handle of about ten inches long, for the purpose of lifting it without drawing off its electricity; and, when the electric state of the lower conductor is to be examined, the whole apparatus must be placed on an insulating stand. To use the electrophorus, rub the upper surface of the resinous plate with a piece of dry fur; cat's skin is

reckoned the best, and it will be excited negatively. Place the upper conductor upon it, and then raise the same by its insulating handle; it will be found to exhibit very faint, if any, electrical signs. Replace the conductor, and, whilst it lies on the surface of the excited plate, touch it with a finger or any other uninsulated conductor, and then raise it again by its handle. It will now be positively electrified, and afford a spark: if it be then replaced on the resinous plate, touched, and again raised, another spark will be procured, and this process may be repeated for a considerable time without any perceptible diminution of effect. Jars may be charged by bringing them in contact with the conductor each time it is lifted, with an instrument of this kind only six inches in diameter. Cavallo charged a jar several times successively, and such was the strength of the charge that it was capable of piercing a card.

194. Such is the tenacity, so to speak, with which this instrument holds the electricity once excited, that some have been led to consider it as affording a perpetual source of that matter. On this opinion Mr. Cavallo makes the following just remarks:—'As to the continuance of this electric plate, when once excited without repeating the excitation, I think there is not the least foundation for believing it perpetual, as some gentlemen have supposed it to be; it being nothing more than an excited electric, it must gradually lose its power, by continually imparting some of its electricity to the air, or other substances contiguous to it. Indeed its electricity, although it could never be proved to be perpetual by experiments, lasts a very long time, it having been observed to be pretty strong several days, and even weeks, after excitation. The great duration of the electricity of this plate, I think, depends upon two causes: first, because it does not lose any electricity by the operation of putting the metal plate upon it, &c.; and, secondly, because of its flat figure, which exposes it to a less quantity of air, in comparison with a stick of sealing-wax, or the like, which, being cylindrical exposes its surface to a greater quantity of air, which is continually robbing the excited electrics of their virtue.' Numerous experiments are given in the writings of electricians as having been performed by the aid of this instrument; these we shall not here detail, but simply remark, that, if properly managed, it will be found capable of communicating a very high charge to tolerably sized Leyden jars

## PART III.

### MECHANICAL EFFECTS OF ELECTRICITY.

195. Under this part of the subject it is intended to give a popular view of a variety of electrical phenomena rather of a general and promiscuous nature, and which, from the variety necessarily involved, could not have been conveniently introduced under any other head. Among others we shall notice chiefly the following, viz. the direction of the electric fluid; its influence in expanding bodies through which it is made to pass; its power in rending solid bodies; its agency in the combustion and oxidation of metallic substances, and in inflaming numerous combustible substances.

### Direction of the Electrical Fluid.

196. From among the numerous experiments given to demonstrate, as far as it can be done the course of the electric fluid in its passages from one body to another, we select the following from Mr. Singer and others.

197. The direction of the electric fluid may be rendered visible by taking a Leyden jar that has been rendered slightly damp by being breathed on, and placing it with its knob in contact with the positive conductor of an electrical machine in a darkened room; when the jar is fully charged, if the action of the machine be continued, the fluid will be observed to pass from the internal to the external coating over the uncoated interval in luminous streams, like water overflowing from the top of a vessel kept constantly supplied. If the jar be removed, and its knob placed against the negative conductor, the stream will evidently pass in the contrary direction. A degree of dampness on the uncoated part of the glass is necessary, in this experiment, to prevent the discharge of the jar by a spontaneous explosion, in which case the fluid passes too rapidly from one surface to the other to allow the observer to ascertain its direction. If the moisture be not sufficient, diverging brushes of light will occasionally pass from the positive surface, instead of the continuous streams above mentioned.

198. Let a light wheel, the vanes of which are made of fine card-paper, be made to turn freely on its axis, a stream of electricity from a pointed wire fixed in the conductor will give it motion; and it will move from the electrified point whether its electricity be positive or negative. In this experiment the current seems to be produced by the recession of the similarly electrified air in contact with the point; and, therefore, the circumstance of the wheel turning in the same direction when the electricity is negative, cannot, as Mr. Singer has justly observed, be considered as a proof of the existence of a double current of the electric fluid.

199. Make a groove, either by bending a piece of clean card-paper, or by hollowing out a piece of baked wood, or by placing, parallel to each other, two straight sticks of sealing-wax; lay the groove upon the plate of Henley's universal discharger, and place a large pith-ball, about half an inch in diameter, so as to be at an equal distance from the two brass knobs of the discharger. The distance of these should be about four inches, and the groove placed in the line joining the knobs. If one of the wires be now connected with the outside of a charged jar, while the knob of it is brought in contact with the other wire of the discharger, so that a small spark may pass from the one knob to the other, the pith-ball will be impelled from the positive to the negative knob. In performing the above experiment Mr. Singer used pointed wires instead of knobbed ones, and assigned, as his reason for this, that the knobs may attract the pith-ball, whereas the stream from the pointed wire must impel it.

200. Mr. Singer in the following experiment has availed himself of the discovery of Cavallo, who observed that some mineral colors are affected by passing over them the electrical discharge. Color, says he, both sides of a card with vermilion, and place it upon the table of Henley's discharger; one of the wires should be beneath the card, and the other in contact with its upper surface; the distance of the points of the wires being one inch. If a charge be now sent through the wires, the fluid will pass from the positive wire across the surface of the card to the part over the negative wire, and will there perforate the card in its passage to that wire. The course of the fluid is indicated by a black line on the card, reaching from the point of the positive wire to the perforation; and by a diffused black mark on the opposite side of the card around it, and next the negative wire. These effects are pretty constant, the black line always appearing on the side of the card which is in contact with the positive wire, and the perforation being near the negative wire.

201. But the most satisfactory exhibition of the course of the fluid from the positive to the negative conductor is afforded in the next experiment, which was the contrivance of Mr. Singer, and which he himself considered as removing all difficulties on the subject. It has, observes he, been long known that a light float-wheel, made by inserting several vanes of card in the periphery of a cork that is made to turn freely on a pin or centre, will be put in motion by presenting it to an electrified point; and the motion of the wheel being always from the point, whether that point was positive or negative, has been occasionally urged as an argument for a double current of the fluid; although it is evident, from what has been already stated, that a point either positive or negative must produce a current, by the recession of the air opposed to it when similarly electrified, by its contact, which is fully adequate to the production of these effects. Conjecturing that the currents of electrified air would not take place in this manner if the points were opposed to each other, the following arrangement was made.

202. A light float-wheel of the above description, being mounted so as to turn freely between two upright wires, was placed on an insulated stem, and introduced between the pointed wires of Henley's discharger, which were placed accurately opposite to each other, and at the distance of rather better than an inch from the upper vanes of their respective sides. On connecting one of the wires with the positive conductor of the machine, and the other with the negative conductor, and turning the machine, the wheel will move in a direction from the positive to the negative wire. On reversing the connexions, so that the wire which was negative may become positive, and that which was positive be made negative the motion of the wheel will be reversed; for it will still move from the positive to the negative wire, thus proving that the electricity moves in that direction. A representation of this wheel, with the method of using it, is given in fig. 3, where A is the float-wheel placed on the universal discharger B, the wires of which, C, C, are directed against the floats of the wheel.

### Expansive Power of the Fluid.

203. The influence of the electric matter in expanding bodies through which it is sent, may be clearly illustrated by these experiments. Place a small card, or the cover of a book, against the outer coating of a charged jar, exposing about a square foot of coated surface; put one end of the discharging rod against the card, and bring the other to the knob of the jar; the charge will pass through the card and perforate it, producing a small bur on the side next the discharging rod, and a larger one on the side which was in contact with the coating of the jar. In the same manner, by using the more powerful charge of a battery, a perforation may be made through a quire of paper or a thin unbound book; and, if either of these be freely suspended between the balls of the universal discharger, no motion of the paper will be produced, but the charge will pass through it without in the least disturbing it, for the same reason that a musket ball will pass through a door without causing it to turn on its hinges, although, under the same circumstances, a very slight force would be sufficient to move it.

204. The effects produced on the card in the preceding experiment, as well as some others that have resulted when the experiment has been varied, have led some electricians to suppose that they might be viewed as indications of the course of the electric matter, and as affording no obscure proof of the existence of two fluids; but Mr. Singer has, in our opinion, satisfactorily shown that they are produced solely by an expansion of the paper.

205. The following illustration of this influence is attributed to Mr. Lane, the inventor of the discharging electrometer. Roll up a piece of soft pipe-clay, in the form of a small cylinder, and insert in it two wires, so that their ends, without the clay, may be about one-fifth of an inch from one another. If a charge be sent through this clay, by connecting one of the wires with the outside of a jar, and the other with the inside, it will be inflated by the shock passing between the two wires, and, after the explosion, will appear swelled in the middle. If the charge sent through it is too strong, and the clay not very moist, it will be broken by the explosion, and the fragments scattered in every direction. To make this experiment with a little variation, take a piece of the tube of a tobacco-pipe, about one inch long, and fill its bore with moist clay; then insert in it two wires, as in the above rolled clay, and send a charge through it. This tube will be burst by the force of the explosion, and its fragments will be scattered about to a great distance. If, instead of clay, the above-mentioned tube of the tobacco-pipe, or a glass tube, which will answer as well, be filled with any other substance, either electric or non-electric, inferior to metal, on making the discharge it will be broken to pieces with nearly the same force.

206. The expansion of fluids by electricity is truly remarkable, and often productive of some singular results. When the charge is strong, no

glass vessel can resist its force. Beccaria placed a drop of water between two wires in the centre of a solid glass ball of two inches in diameter; on passing a shock through the water the ball was dispersed with great violence. Mr. Morgan succeeded, by the same means, in breaking green glass bottles, filled with water, when the distance between the wires that conveyed the spark and the sides of the glass was upwards of two inches.

207. A single spark may be made to perforate a strong glass tube by the following simple process: fill a small phial with olive oil, and insert into it a pointed wire bent at right angles, so that by sliding through a cork fixed in the neck of the phial, the point of the wire may rest against any part of the inside beneath the oil: attach the phial by its wire to the conductor of the machine, and bring the knuckle or a brass ball near the outside of the phial, opposite to the point of the wire within it; a spark will pass from the point to the knuckle, and make a small hole in the glass. By varying the situation of the point, many such perforations may be made in the glass.

208. Of this very singular experiment Mr. Singer offers the following rational account. The point, he says, serves as an internal coating to a very small portion of the glass; and the charge being prevented from extending, by the surrounding oil, the whole power of the machine is concentrated in that point, and consequently soon overcomes its resistance. Similar effects will always result when a large quantity of electricity is suddenly transferred to a comparatively limited surface.

209. Make a small mortar of ivory, with a cavity of half an inch diameter and an inch deep; insert two wires through the sides of the mortar, so that their points within the cavity may be separated by an interval of $\frac{1}{4}$ of an inch; fit a cork cap so as to close the aperture as accurately as possible without friction: when a strong charge is passed through the wires, the air within the mortar will be suddenly expanded, and the cork projected to a distance with some violence.

210. Satisfactory and striking as the preceding experiments are, they appear inferior to the following: in making experiments on the effects of explosions of electricity sent through metallic bodies, Dr. Priestley found that a chain which he had used as the medium of conveying the charge was shorter after being used than it was before. This led him to try the effect of a strong charge on a definite length of chain: the charge was sent from sixty-four square feet of coated surface, through twenty-eight inches of chain, which, on being measured again, was found to be contracted a quarter of an inch in its whole length.

211. This experiment was repeated by Mr. Nairne with a piece of hard-drawn iron wire ten inches in length, and $\frac{1}{100}$ of an inch in diameter. Through this wire he discharged twenty-six feet of coated surface nine times; after the sixth and the ninth time the wire was measured, and it was found to be shortened $\frac{1}{10}$ of an inch after each discharge. By farther discharges sent through it, the wire was shortened $1\frac{1}{10}$th inch. That this contraction arose from expansion appeared from the wire having increased in thickness whilst it was diminished in length.

## Solid Bodies ruptured by Electricity.

212. The simplest form, perhaps, in which this can be done, is to place on the table of Henley's discharger a piece of dry writing-paper, and pass over it, by means of the pointed wires, a powerful charge from a large jar; if the wires be placed at about two inches asunder, and so as to touch the ends of the paper, it will be torn in pieces. If, instead of the paper, a number of wafers be placed in the circuit, they will be curiously dispersed, and many of them broken to pieces.

213. Make two small holes in the opposite ends of a piece of oak, of about half an inch long and a quarter of an inch thick; introduce two wires into the holes, so that their extremities within the wood may be rather less than a quarter of an inch distant; on passing a strong charge from one wire to another, the wood will be split. Several other substances that are imperfect conductors, such as loaf-sugar, marble, &c., undergo similar injuries, when introduced into an electrical circuit; and even the hardest bodies, and the most perfect non-conductors, such as glass, are perforated or broken by a strong charge.

214. Lay a piece of plate-glass of about an inch square, and half an inch thick, on the table of the universal discharger, or screw it very tightly within the press of the same; set the prints of the sliding wires opposite to each other, and against the under surface of the glass, so that the charge may pass along that surface. If now a strong charge be passed in this way, the glass will be broken into small fragments, and some of it reduced to an impalpable powder.

215. The following experiment affords a beautiful, though rather an expensive, illustration of the same principle. Charge a very large jar, and connect its external coating with that of one ten or twelve times smaller; form a communication between their internal coatings by the discharging rod, and the small jar will be broken in pieces, by the strength of the quantity of electricity thus suddenly transferred to it.

## Inflammable Substances Kindled by Electricity.

216. Almost all inflammable substances may be kindled by means of electricity, but those generally selected for the purpose of experiment are resin, gunpowder, rectified spirit of wine, ether, and hydrogen gas.

217. The common method of kindling resin by the electric spark is to pulverise it, and dust the powder on some dry cotton wool. Thus, if a small quantity of flax, or of cotton wool, be loosely tied on one of the knobs of the discharging rod, and a little finely-powdered resin dusted on it, and a jar be discharged by bringing the end of the rod thus prepared in contact with the knob of the jar, the charge will pass through the flax, or wool, and in so doing will melt and ignite the resin, and set the whole on fire. A very neat contrivance for giving this experiment

a better effect is represented by fig. 4. A is a mahogany board, six inches in length, three in breadth, and half an inch in thickness. B is a glass pillar fixed in the middle of A, and supporting a piece of wood C, which is three inches long, an inch and a half broad, and about three quarters of an inch thick. In each end of this piece there is a small screw-ring: the extremities of these screws just touch a wire proceeding to each of them from two small brass knobs inserted at the ends of a shallow groove on the upper side of C; these rings serve to hook the chains on when the instrument is used. On the back part of C stands the perpendicular piece D, in the top of which is fixed the brass pin E. To use this for the purpose of igniting resin, it is only necessary to dust the cotton with powdered resin, and hang it on the pin E, letting the lower part of it reach down to the piece C. Connect one end of C with the inside of a jar and the other end with the outside; discharge the jar, and the fluid in passing between the two small brass knobs will inflame the resin and kindle the cotton.

218. But the inflammation of resin is rendered still more striking by the following experiment: let a flat porcelain dish be filled with water, and on the surface of the water strew a quantity of finely powdered resin; place two wires at the opposite sides of the dish, having their ends near the surface of the water, and at about the distance of four inches from each other. Pass the charge of a large jar through this circuit, and the resin which forms a part of it will be beautifully inflamed.

219. The firing of gunpowder by the electrical explosion requires considerably more care and address than the firing of resin. It may, however, be effected by the following method: take either a large goose-quill or a small cartridge of paper, and fill it with gunpowder ground very fine; into this insert two wires, one at each extremity, so that their ends within the quill or cartridge may be about one-fifth of an inch from each other: this done, send the charge of a phial through the wires; and the spark between their extremities, that are within the cartridge, or quill, will inflame the gunpowder. If the gunpowder be mixed with steel-filings, it will take fire more readily, and with a very small charge.

220. Rectified spirit of wine, or ether, may be thus inflamed by a single spark from the conductor of the machine when in action: hang to the prime conductor a short rod having a small knob at its end; then pour some spirit of wine, a little warmed, into a metallic spoon; hold the spoon by the handle, and place it so that the small knob on the rod may be about one inch above the surface of the spirit. In this situation, if a spark be taken from the knob, it will set the spirit on fire. This experiment may be varied and rendered very agreeable to a company of spectators. A person standing upon the insulating stool, and communicating with the prime conductor, may hold the spoon with the spirit in his hand, and another person standing upon the floor may set the spirit on fire by bringing his finger within a small distance of it. Instead of his finger, he may fire the spirit with a piece of ice, when the experiment will seem much more surprising. If the spoon is held by the person standing upon the floor, and the insulated person brings some conducting substance over the surface of the spirit, the experiment succeeds equally well. This experiment is sometimes rendered still more striking in the following manner: near the prime conductor of the machine, place on the table three wine glasses; connect the first glass with the conductor by a brass chain, which will reach to the bottom of it; and with it let the second and third be connected by a piece of fine brass wire, bent in the form of the letter A. Fill the first and second glasses with water, and into the third pour a little ether; turn the machine, and with a wire, having a small ball affixed to it, draw a spark from the ether, and it will be immediately inflamed. In this experiment the electric fluid had to pass through two distinct portions of water before it could come to the ether.

221. Hydrogen gas is generally inflamed by the electric spark in the following manner: take a brass cannon, such as is represented in fig. 5, and charge it with hydrogen gas by holding the mouth of it for about half a minute over a stone or glass bottle in which the gas is generated, and then fix the cork tightly into the mouth of the cannon. The person who is to discharge it must now stand on the insulating stool, and, holding in his hand a chain attached to the prime conductor, must, with a wire and ball held in the other hand, communicate a spark to the knob of the cannon: this spark will pass into the interior of the cannon through the glass tube B, and the gas will instantly explode with a loud report, and the cork will be driven out to a considerable distance. This experiment may be rendered more effectual by mixing about one-third of oxygen with the hydrogen gas; or, if oxygen cannot be conveniently procured at the time, the operator may easily contrive to have some atmospheric air in the cannon, which will render the hydrogen gas more explosive.

222. The very great ease with which inflammable air is kindled by even a small spark of electricity seems to have suggested to M. Volta the idea of what he calls his inflammable air-lamp, an instrument which appears to have laid the foundation for the patent apparatus for obtaining instantaneous light. This curious instrument is represented in fig. 6, where A is a glass globe for containing hydrogen gas; B a glass reservoir for holding water; and D a stop-cock, by which a communication is formed between the water and the gas. The water passes into the globe through the pipe *gg*, which is fixed into the top of the reservoir A; at *s* there is a cock to cut off or open a communication between the air and the jar K. N is a contrivance for holding a wax-taper; L a brass pillar, on the top of which is fixed a ball of the same metal; *a* is a pillar of glass, with a socket at the top, in which the wire *b* slides, having a ball screwed on the end of it. F is a cock by which the globe is filled with hydrogen gas, and which afterwards serves to confine it, and what water falls into B and A. To use this instrument,

having filled the globe with gas, and the reservoir A with water, turn the cocks D and *s*, and the water will fall into the globe, forcing up a quantity of gas, which will rise through the pipe K. If, now, an electric spark be made to pass from the ball *m* to that marked *n*, it will set fire to the gas which passes through the pipe K. To extinguish the lamp, first shut the cock *s*, and then D. The gas is obtained in the usual way, from diluted sulphuric acid and iron filings; and the globe is to be filled in the following manner:—Having previously filled it with water, place the foot R in a vessel of water, so that it may be covered, and the bent glass tube, through which the gas is to be introduced, may pass commodiously below the foot. When the gas has displaced nearly all the water, turn the cock F, and the lamp is ready for use.

223. This instrument is sometimes constructed so as to be connected with an electrophorus for the purpose of producing a light at pleasure. In this case the electrophorus is placed in a box beneath the vessel containing the hydrogen gas; from this box a wire passes through a glass tube to the opening of the stop-cock. The cover of the electrophorus must be connected by a silk string with the handle of the stop-cock, so that the same motion that opens the cock, may raise the cover of the electrophorus, and the spark that strikes from it be conveyed by the insulated wire to the stream of gas, which it inflames. This effect will take place every time the stop-cock is opened, for the electrophorus will produce sparks for a considerable time, without any fresh excitation; and the quantity of gas consumed at each repetition of the process is very small, so that a light may be obtained above a hundred times before the contents of the reservoir are expended; and it may then be easily replenished.

224. But by far the most remarkable effects of electricity in producing combustion, result from its action on metallic substances. This property of the electric matter seems to have been first observed by the celebrated Dr. Franklin, who made several experiments on the subject. These experiments were repeated and extended by Mr. Kinnersly, and also by Beccaria; and have since then been prosecuted with great accuracy by Mr. Brook, Dr. Van Marum, Mr. Cuthbertson, Mr. Singer, and others. In treating on this part of the subject, we shall, as in the preceding instances, give a course of progressive experiments, which may be made with an appropriate apparatus, from a single jar of a tolerably large size, up to a powerful battery, previously remarking that the whole of the apparatus must be in the very best state in which it can be put, otherwise disappointment, in many cases, and inaccuracy in all, will be the result.

225. The slightest indication of the fusing of metallic substances is observed in the discharge of the Leyden phial: on this occasion, if the discharge be made by means of the common discharging rod, the knob that touches the outside coating will be found to adhere slightly to the jar after the discharge; and this arises from the fusing of a small portion of the tin-foil coating.

226. This may be rendered very obvious by the following experiment:—Charge a large jar, and place a smooth piece of coin between the knob of the discharger and the coating of the jar; when the discharge has been made, the piece of coin will be found slightly adhering to the tin-foil, by its fusion at the point of contact, and will remain so as to require some force to separate them.

227. Dr. Franklin's experiments on the fusing of metals may be thus imitated:—Take three pieces of window-glass, each one inch wide, and three inches long, and place them contiguous to each other, with two narrow strips of gold-leaf between them, so that the middle glass may have, on each side of it, a strip of gold, with its ends projecting a little beyond the glass. Let the whole be properly secured within the press of the universal discharger; pass the charge of a large jar through the strips of gold, they will be melted and driven into the glass. The outer pieces of glass are generally broken, but the middle piece is often left entire, and is marked with an indelible metallic stain on each of its surfaces.

228. The colors produced when metals are thus fused, either on glass or paper, are sometimes exceedingly beautiful, and have been in some cases employed in impressing letters, and ornaments of various kinds, on silk and paper. The process observed in such cases, Mr. Singer thus describes in his Elements:—'The outline of the required figure is first traced on thick drawing paper, and afterwards cut out in the manner of stencil plates. The drawing paper is then placed on the silk or paper intended to be marked; a leaf of gold is laid upon it, and a card over that; the whole is then placed in a press, or under a weight, and a charge from a battery sent through the gold leaf. The stain is confined, by the interposition of the drawing paper, to the limit of the design; and in this way a profile, a flower, or any other outline figure may be very neatly impressed.'

229. In describing Cuthbertson's electrometer, No. 177, we made some remarks on the fusing of wire, by passing through it the discharge of accumulated electricity; it may be necessary to offer here some general observations on the same subject; and to give some account of the results of the experiments made by those whose names we have already enumerated.

230 For the fusing of wires of different lengths very large batteries were formerly considered as indispensable; but Mr. Singer observes, that, if the wire be sufficiently fine, a single jar, exposing a coated surface of about 190 square inches, will be sufficient to afford an example of the effect. The finest flattened steel wire, sold at the watchmakers' tool shops under the name of pendulum wire, is the best for the purpose; harpsichord wire not being fine enough, excepting where great power is used. Cuthbertson's Balance Electrometer should be invariably used to regulate the charge; the circuit made as short as possible; and the wire to be fused placed in a straight line, and held at the ends between a small forceps made of wire.

231. The following is the substance of Mr. Singer's remarks on the numerous experiments of Messrs. Brook and Cuthbertson on the fusion of metallic wires. Their conclusion was, that the action of electricity on wires increases in the ratio of the square of the increased power: since two jars, charged to any degree, will meet four times the length of wire that one jar will melt; and this will be again quadrupled by doubling the height of the charge.

232. This law, adds Mr. Singer, I have found, obtains in all accurate experiments with moderate lengths of wire; and it is apparent in Mr. Cuthbertson's experiments, to some extent. His batteries usually contain fifteen jars, and one of these is just sufficient to fuse half an inch of wire of $\frac{1}{150}$th of an inch diameter: but the whole fifteen jars combined, will fuse sixty inches of the same wire. Mr. Singer made some experiments with an iron wire of $\frac{1}{250}$th of an inch diameter, on an extensive scale; but he found that some of the charge was lost in pervading such a considerable length of wire, so much so, that the explosion of the battery, at other times remarkably loud, was then scarcely audible. With a battery, however, of forty feet of coated surface, Mr. Singer says he frequently melted eighteen feet of the above-mentioned wire by a single explosion, and the phenomena were remarkably brilliant; a shower of intensely ignited globules being dispersed in every direction. This law, however, Mr. Singer found to vary with the thickness of the glass employed; thick jars displaying the same intensity with a comparatively small quantity of electricity; and consequently having, as he expresses it, less wire-melting power. Of this he produces a proof, furnished by his large Leyden jar, to which we have already alluded; this jar, from the extent of its coated surface, ought to have melted three feet of wire, with a charge of thirty grains; but from its extreme thickness, which limited its electrical virtue, it would only melt eighteen inches. Mr. Singer remarks, that this is correspondent with the conclusion of M. Cavendish, that the quantities of electricity required to charge different coated jars of the same extent, will be in the inverse proportion of their thickness.

233. The fusion of wire may therefore be employed as a measure of the quantity of electricity accumulated on any charged surface; for the preceding experiments show that any given quantity of electricity will fuse the same length of wire, whether that surface be disposed on two jars or one; hence it may be inferred that the actual intensity of a charge does not materially affect its power in melting wire. This test is therefore practically useful; for the various electrometers measure only the intensity, and are as much affected by one jar as by a battery of 100. When the fusion of wire is employed as a test of electrical power, care should be taken that the length of the circuit be always the same, and that the degrees of ignition be uniform; for a wire may be melted with but slight variations of appearance when very different portions of electricity are passed through it. The lowest degree of perfect ignition ought therefore to be obtained in all comparative experiments; and, as soon as the discharge is made, the wire should become red-hot in its whole length, and then fall into fine globules.

234. The gradually increasing effects produced are very remarkable, when, on wires of the same length and diameter, progressively strong charges are transmitted. If the charge be very low, it is found that the color is changed to yellow; it then becomes blue by a higher charge; then red-hot; then red-hot and melted into balls; and, if we increase the charge still further, it becomes red-hot, and drops into balls, then disperses in a shower of balls, and finally disappears with a bright flash, producing an apparent smoke, which turns out when collected to be a fine powder, consisting of the metal combined with oxygen, and weighing more than the metal which was originally fused.

235. The experiments and results already enumerated do by no means form the boundary of the power of the electric fluid; bodies which resist the most intense heat, produced in the common way, are by it converted into oxides in a moment. Of this more will be said in a future part of this article; in the meantime a few examples may be given, which properly belong to the present. The most laborious experimenters on this part of electricity have been Cuthbertson and Singer, of whose operations we shall here avail ourselves, as being both numerous and valuable. The apparatus used by Mr. Cuthbertson, and, in some of his experiments, by Mr. Singer also, may be thus described:—

236. It consists of a glass cylinder *a b*, fig. 7, about eight inches high, and two inches and a half diameter, mounted air-tight with two brass caps. On the lower cap *a* is screwed a stop-cock, and above the cap is fixed a small roller, on which a quantity of wire, attached to a pack-thread at intervals of four inches, is coiled. A brass tube *c*, about three inches long, is screwed into the centre of the upper cap *b*, and, by means of a long needle, the end of the packthread and wire is thrust through it, and hog's lard is placed in the tube, so that the wire and packthread shall always move through it air-tight. In this way the wire is extended in the centre of the cylinder, and, when one length is exploded, another may be drawn forward by means of the packthread, without opening the cylinder. For ascertaining the quantity of air absorbed during the process, a gauge, represented by A, about ten inches long, made of a glass tube, is screwed into the lower end of the stop-cock, and immersed in a vessel of quicksilver, the rise of which, when the stop-cock is opened, will be a measure of the air absorbed. The air left in the receiver, after a number of explosions, is always found to have been deprived of a portion of its oxygen; and, if hydrogen or nitrogen gas be substituted in place of atmospheric air, the metal will not suffer any oxidation, but will be fused, and minutely divided.

237. To accomplish the complete oxidation of metallic substances, a higher power is required than that which is merely adequate to fuse them. The following is a statement of the comparative strength of the charges which Mr. Cuthbertson

employed in exploding the wires mentioned, the length of each wire being ten inches: the coated surface was the same in all the experiments, viz. one of his batteries of fifteen jars, exposing seventeen feet of coated surface. The column marked A, shows the diameter of the wires in parts of an inch; B the number of grains with which the electrometer was loaded; and C the color of the oxide deposited on the receiver:—

| | A. | B. | C. |
|---|---|---|---|
| Lead wire . . | $\frac{1}{90}$ . | 20 | . Light gray. |
| Tin wire . . | $\frac{1}{90}$ . | 30 | . Nearly white. |
| Zinc wire . . | $\frac{1}{90}$ . | 45 | . Nearly white. |
| Iron wire . . | $\frac{1}{150}$ . | 35 | . Reddish brown. |
| Copper wire . | $\frac{1}{150}$ . | 35 | . Purple brown. |
| Platina wire . | $\frac{1}{150}$ . | 35 | . Black. |
| Silver wire . . | $\frac{1}{150}$ . | 40 | . Black. |
| Gold wire - . | $\frac{1}{150}$ . | 40 | . Brownish purple |

238. Mr. Singer was of opinion that the charges here given by Mr. Cuthbertson were rather high, and attended with considerable risk of fracture to the jars: he repeated the experiments with shorter lengths of wire, and of less diameter; and with more moderate charges obtained the following results:—

| | A. | B. | C. |
|---|---|---|---|
| Gold wire | $\frac{1}{180}$ | 18 | Purple and [illegible]rown. |
| Silver wire | $\frac{1}{100}$ | 18 | Gray, brown, and green. |
| Platina wire | $\frac{1}{180}$ | 13 | Gray and light brown. |
| Copper wire | $\frac{1}{180}$ | 12 | Green, yellow, and brown. |
| Iron wire . | $\frac{1}{180}$ | 12 | Light brown. |
| Tin wire . | $\frac{1}{180}$ | 11 | Yellow and gray. |
| Zinc wire . | $\frac{1}{180}$ | 17 | Dark brown. |
| Lead wire . | $\frac{1}{180}$ | 10 | Brown and blue gray. |
| Brass wire . | $\frac{1}{180}$ | 12 | Purple and brown. |

239. In the above experiments Mr. Singer did not use the receiver; the wires, which were five inches in length, were stretched parallel to the surface of a sheet of paper, and distant from it about one-eighth of an inch. Brass wire is sometimes decomposed by the electrical charge, in which case its component parts, copper and zinc, are separated from each other, and appear in their distinct metallic colors when the explosion is made over a piece of glass. Indeed the figures of all the oxides are most beautiful when impressed on glass, although their colors are certainly less permanent.

240. This most amazing power of the electric matter is not only adequate to the oxidation of metallic substances, but is yet more remarkable in restoring oxides, already formed, to their metallic, or original state, for which purpose a very simple process will be found sufficient.

241. Into a small glass tube introduce a little of the oxide of tin; let it cover about half an inch of the lower internal surface. Place the tube thus prepared on the table of Henley's discharger, and introduce the pointed wires at each end, that the oxide may form part of the circuit. Pass now several strong charges in succession through the tube, taking care to replace the oxide in its proper situation, should it be dispersed. If the charges are strong, the tube will soon become stained with the tin revived from the oxide.

242. In the same way other metallic oxides may be revived; but if vermilion be employed, which consists of sulphur and mercury, the mercury will be separated with such ease as that the charge of a moderately sized jar will be found quite sufficient.

### Decomposition of Water by Electricity.

243. The decomposition of water by electricity was first effected by Van Troostwyk and Deiman, assisted by Mr. Cuthbertson; this they effected by means of a complicated apparatus, and a very tedious process. Their method of procedure was improved on by Dr. Pearson, and after him by Mr. Cuthbertson: but the most simple form of an apparatus for this purpose is that of Dr. Wollaston. This apparatus is thus constructed:—Two finely pointed wires of gold or platina are inserted into capillary tubes; each wire is thrust into the tube till it nearly reaches the end of it, and the glass is softened by heat until it adheres to the wire and covers its point. The glass is then carefully ground away, till the point of the wire can be seen by the help of a magnifying glass. One of these wires is made to communicate with the ground, or with the negative conductor of the machine, and the other with an insulated ball placed near the positive conductor, the two points are placed near each other in a vessel of water; when a current of sparks is discharged through the wires, a series of minute bubbles of gas will rise from the points of the gold wires, and, when collected in an inverted receiver, will explode on the application of a lighted taper. Dr. Wollaston found by experiment, that a point $\frac{1}{700}$ of an inch in diameter, decomposed the water when the spark which passed from the conductor to the insulated ball was $\frac{1}{8}$ of an inch in length; and that a point $\frac{1}{1500}$ of an inch in diameter, produced the same effect when the sparks were only $\frac{1}{20}$ of an inch in length. Hence the rapidity of the decomposition was in proportion to the limited size o the point of the wire.

244. Of the results obtained in some experiments made with this apparatus, Dr. Wollastoi gives the following account. By transmitting a current of sparks by means of two gold point over the surface of a card a little moistened, and tinged with litmus, and placed between the points, a redness was perceived about the positive wire after a few turns of the machine. When the negative wire was placed upon the red spot i was quickly restored to its former color. Hence he infers that the effect of an acid is produced a the positive wire; and that this effect is counteracted by reversing its electricity.

245. Dr. Wollaston next coated two wire with sealing-wax, so that their ends only were exposed: these he inserted into a solution o copper, and found that, on transmitting a curren of sparks between them, the negative wire wa coated with copper: the electricity of the wire being reversed, the copper quickly disappeared

246. When it is wished to decompose oils alcohol, ether, &c., a much more simple, and les expensive apparatus will be found to answe every purpose. This apparatus, which is repre sented by fig. 8, consists of a glass tube having a platina wire projecting from the top inwards an reaching nearly to the lower end. The lowe

extremity is open, and is placed in a metallic dish nearly filled with the fluid which is to be decomposed. The cylinder must be filled with the fluid as receivers are filled with water in the pneumatic trough. When charges are successively sent through the wire, the fluid will be gradually decomposed, and the gaseous product rising to the upper part of the cylinder will displace the liquid. In all experiments of this kind the glass used ought to be very strong to resist the expansion caused by the explosion.

247. Having spoken of the decomposition of water by means of the electric fluid, it may be proper just to notice the process of forming water from the gases that compose it, by the action of the same agency. For this curious experiment Mr. Singer employed the apparatus represented in fig. 9, which consists of a stout globe of glass, with a stop-cock, having a wire passing through its centre to within a short distance of the cap to which the stop-cock is screwed. The globe must be exhausted by means of an air-pump, and then screwed on a receiver containing a mixture of oxygen and hydrogen gases, furnished with a stop-cock. When the cocks are opened, the globe will be filled with the gases; they must then be shut, and a spark passed from the wire in the inside of the globe to the cap. A bright flash follows, and the inside of the globe becomes covered with moisture; the cocks are then to be opened, and more gas will rush into the globe. The cocks being again closed, a second explosion may be made, which will increase the dew on the inside of the globe; and the experiment may be repeated in this way until drops of water may be observed.

248. Such experiments as the preceding naturally led to numerous others on various liquids and also on different gaseous bodies: to detail these would be foreign to our purpose; yet to pass them over in silence would be to do them injustice. We shall, therefore, merely give the results of some remarkably fine experiments by Cavendish, and others, as drawn up in a tabular form by Mr. Singer. The numbers prefixed to some of the gases indicate the proportionate measures employed of each.

| MIXED GASES. | RESULT. |
|---|---|
| Atmospheric air and hydrogen | Water and nitrogen. |
| Oxygen and hydrogen | Water. |
| Chlorine and hydrogen | Muriatic acid. |
| Muriatic acid and oxygen | Chlorine. |
| Carbonic oxide and oxygen | Carbonic acid. |
| Nitrogen and oxygen | Nitric acid. |
| Sulphurous acid and oxygen | Sulphuric acid. |
| Phosphureted hydrogen and oxygen | Water and phosphoric acid. |
| Sulphureted hydrogen and oxygen | Water and sulphurous acid. |
| Oxygen and ammonia | Water and nitrogen.* |
| 100 olefiant gas and 284 oxygen | Carbonic acid and water. |
| 100 olefiant gas and 100 oxygen | Carbonic oxide and hydrogen. |
| 100 carbureted hydrogen and 100 oxygen | Carbonic oxide and hydrogen. |
| 100 carbureted hydrogen and 200 oxygen | Carbonic acid. |

| COMPOUND GASES. | RESULT. |
|---|---|
| Muriatic acid | Hydrogen.* |
| Fluoric acid | Hydrogen.* |
| Nitrous gas | Nitric acid and nitrogen. |
| Carbonic acid | Carbonic oxide and oxygen. |
| Sulphureted hydrogen | Sulphur and hydrogen. |
| Phosphureted hydrogen | Phosphorus and hydrogen. |
| Ammonia | Hydrogen and nitrogen. |
| Olefiant gas | Charcoal and hydrogen. |
| Carbureted hydrogen | Charcoal and hydrogen. |

The results marked with a star are given on the authority of Dr. Henry and Mr. Dalton. In making the above experiments when the mixture consisted of inflammable gases with oxygen, the change was usually effected by a single spark; but in other cases it was found necessary to continue the current of sparks for many hours.

### Electrical Configurations.

249. This is a most interesting and curious branch of mechanical electricity, and one which certainly challenges a more vigorous enquiry than has hitherto been made respecting it. It is thought by some that the experiments which we shall here briefly notice afford satisfactory proof that electricity is the real cause of crystallisation. The subject seems to have been first noticed by professor Lichtenberg, of Gottingen, and afterwards by Mr. Bennet, Cavallo, and others.

250. Excite a plate of any resinous substance, as gum-lac, by friction, and let any metallic body of any shape whatever, a brass ring for instance, be placed upon the plate. Let the ring be then electrified with an electricity opposite to that of the plate, and afterwards removed from the plate by a stick of sealing-wax, or any other non-conductor. Let some powdered resin be now shaken upon the plate, then if the plate has been excited negatively, and the brass ring positively, the powder will fall only on those points of the plate that were touched by the ring, and will form radiating appearances resembling stars, while almost no powder will be found on any other part of the plate. If, on the other hand, the

plate has been electrified positively, while the ring was electrified negatively, the powdered resin will fall only on the parts of the plate which were formerly uncovered, the figures being now indicated by the absence of the powder.

251. Mr. Bennet who repeated with much care the experiments of Lichtenberg, has given the following account of the method which he adopted for rendering figures produced in this way permanent. When it is wished to make the figures red, 'Take a pound of rasped Brasil wood; put it into a kettle with as much water as will cover it, or rather more: also put in about an ounce of gum arabic, and a piece of alum about the size of a large nut; let it boil about two hours, or till the water be strongly colored; strain off the extract into a broad dish, and set it in an iron oven, where it is to remain till all the water be evaporated, which with me was effected in about twelve hours; but this depends on the heat of the oven, which should not be so hot as to endanger its burning. Sometimes I have boiled the strained extract till it was considerably inspissated before it was placed in the oven, that it might be sooner dry.

252. 'When it is quite dry, but not burnt, scrape it out of the dish, and grind it in a mortar till it be finely pulverised. In doing this, it is proper to cover the mortar with a cloth, having a hole through it for the pestle, to prevent the powder from flying away and offending the nose, and also to do it out of doors if the weather be dry and calm, that the air may carry away the powder necessarily escaping, and which otherwise is very disagreeable. When ground, let it be sifted through a fine hair sieve, returning the coarser part into the mortar to be ground again.

253. 'The plate I have mostly used, was composed of five pounds of resin, half a pound of bees'-wax, and two ounces of lamp-black, melted together, and poured upon a board sixteen inches square, edged round with slips of wood, at least half an inch high, to confine the composition whilst fluid: the plate was thus half an inch thick, which is better than a thinner plate, the figures being more distinct. After the composition is cold, it will be found covered with small blisters, which may be taken out by holding the plate before the fire till the surface be a little melted, then let it cool again; and upon holding it a second time to the fire, more blisters will appear; but by thus repeatedly heating and cooling the surface, it will at last become perfectly smooth. Some plates were made smaller, and the resinous composition confined to the form of an ellipsis, a circle, or escutcheon, by a rim of tin half an inch broad, and fixed upon a board.

254. 'The next thing to be done is to prepare the paper, which is to be softened in water, either by laying the pieces upon each other in a vessel of cold water, or first pouring a little hot water upon the bottom of a large dish; then laying upon it a piece of paper, so that one edge of the paper may lie over the edge of the dish, to remain dry, that it may afterwards be more conveniently taken up. Then pour more hot water upon its upper surface. Upon this place another piece in the same manner, again pouring on more water, and thus proceed till all the pieces are laid in. By using hot water, the paper will be softened in a few minutes.

255. 'When the figures are to be made, the resinous plate must lie horizontally, whilst the electricity is communicated, if the experiment requires any thing to be placed upon the plate: but it is convenient afterwards to place it in a vertical position whilst the powder is projected, lest too much powder should fall where it is not required.

256. 'A little of the powder may be taken between a finger and thumb, and projected by drawing it over a brush; or, what is better, a quantity of it may be put into the bellows and blown towards the plate. When the figure is sufficiently covered with powder, let the plate be again laid horizontally upon a table; then take one of the softened papers out of the water by its dry edge, and lay it carefully between the leaves of a book, pressing the book together, and permitting it to lie in this situation about half a minute. Then remove the paper to a dry place in the book, and press it again about the same time, which will generally be sufficient to take off the superfluous moisture. Then take up the paper by the two corners of its dry edge, and place the wet edge a little beyond the figure on the resinous plate, lowering the rest of the piece gradually till it covers the figure without sliding; then lay over it a piece of clean dry paper, and press it gently; let it remain a short time, and then rub it closer to the plate with a cloth; or, which is better, press it down by means of a wooden roller covered with cloth, taking care that the paper be not moved from its first position.

257. 'When the paper is sufficiently pressed, let it be taken up by its dry edge, and laid upon the surface of a vessel of water, with the printed side downwards; by this means the superfluous powder will sink in the water, and the figure will not be so liable afterwards to spread on the paper. After the paper has remained on the water a few minutes, take it up and place it between the leaves of a book, removing it frequently to a dry place. If it be desired that the paper should be speedily dry, let the book-leaves in which it is to be placed be previously warmed, and by removing it to several places it will be dry much sooner than by holding it near a fire. By the above process, it is obvious that leather, calico, or linen, as well as paper, may be printed with these figures, and the effects of the diffusion of electricity upon a resinous plate be exhibited to those who have not leisure or inclination to perform the experiments.'

258. To the above it may be proper to add, that with a resinous plate of the kind now described, a very beautiful exhibition may be made of the different powers of positive and negative electricity. For this purpose prepare equal quantities of red lead and resin, by weight, finely powdered and intimately mixed, by being sifted together through a fine hair sieve. Put this powder into a bottle of India rubber for use. Let now a small jar be charged at the positive conductor of the machine, and, with its knob,

quickly write the letter P on the resinous plate: take the bottle containing the mixed powders, and by gently striking the sides of it between the palms of the hands, the mouth of it being directed towards the plate, which must be placed in a vertical position, project on the electrified part a little of the powder, and the letter will instantly appear, well defined, and covered with the red lead, while the resin will be dispersed. If now the whole be wiped clean off, and, with a jar charged at the negative conductor, the letter N be written on the plate, and the powder projected as before, it will be found that the negative electricity has selected the resinous particles for the formation of the letter, while those of the red lead have been rejected.

### Magnetic Effects of Electricity.

259. The connexion between magnetism and electricity will be fully treated of in a subsequent part of this article; at present we shall merely offer the following general remarks in the way of showing the amount of what was known on the subject previously to the interesting discoveries recently made.

260. Dr. Franklin appears to have been the first who paid any serious attention to this subject. He sent the charge of some large electrical jars through fine sewing-needles; the ends of the needles were rendered blue, and on being carefully laid on water they traversed, evincing evident proofs of polarity. The most remarkable circumstance attending these experiments was, that if the needle lay east and west when the charge was passed through it, the end which was entered by the fluid pointed to the north: but if it lay south and north, the end which lay pointing to the north would continue to do so, whether the charge entered by that end or the other; although the Dr. imagined that a still stronger charge would have reversed the poles, even in that situation, since this effect had been actually produced by lightning. The polarity he also found to be strongest when the needle received the charge while lying north and south, and weakest when it lay so as to point east and west.

261. But the experiments most to be relied on were made by Van Marum with the large machine and battery in the Tylerian museum at Haarlem. He and his assistants tried to give polarity to needles made of watch-springs, of from three to six inches in length; and also to steel bars nine inches long, from a quarter of an inch to half an inch broad, and about a line in thickness. The result was, that when the bar was placed horizontally in the magnetic meridian, whichever way the shock entered, the end of it that stood toward the north acquired the north polarity, and the opposite end acquired the south. If the bar, before it received the shock, had some polarity, and was placed with its poles contrary to the usual direction, its natural polarity was uniformly diminished, and often reversed; so that the extremity of it, which in receiving the shock pointed to the north, became the north pole, &c.

262. When the bar was struck standing perpendicularly, its lowest end became the north pole in any case, even when the bar had previously some magnetism, and was placed with the south pole downwards. Things remaining the same, the bars seemed to acquire an equal degree of magnetic power, whether they were struck whilst standing horizontally in the magnetic meridian, or perpendicular to the horizon. When the needle was placed in the magnetic equator, whichever way the charge entered, it never produced any magnetism; but if it was passed through its width, then the needle acquired a considerable degree of magnetism, and the end which lay towards the west became the north pole, and the other end the south pole. If a needle or bar, already magnetic, or a real magnet, was struck in any direction, its power was always diminished. For this experiment they used considerably large bars, one of which was 7·08 inches long, 0·26 broad, and 0·05 thick. When the shock was so strong in proportion to the size of the needle, as to render it hot, then the needle generally acquired no magnetism at all, or very little. These experiments were made with the power of a battery composed of 135 phials, containing among them about 130 square feet of coated surface.

### Medical Electricity.

263. The very remarkable properties of the electric fluid seem to have occasioned the application of its powers to organised bodies at an early period of its history; and the results, whether real or imaginary, gave rise to various opinions, which are now only viewed as monuments of credulity and imposture. It is not our intention to enter here minutely into an investigation of this department of the science of electricity; yet, although this would be improper on several grounds, we must not pass it over in silence. The application of electricity as a medical agent has recently been much revived; but that application is, we believe, most successfully made in the form of Voltaic electricity; and will therefore fall, with more propriety, under consideration in another place. From the numerous respectable testimonies extant, as to the real utility of electricity in the healing art, we shall make a choice selection, which it is hoped will satisfy the reader, that in the hands of a skilful operator, it may be applied in numerous instances with certainty of success. Let it however be observed that no one ought to attempt its application who is not thoroughly conversant with the use of the apparatus, and capable of forming a correct judgment, as to the strength and duration of the application.

264. Speaking of the power of the apparatus which ought to be used in the application of electricity for medical purposes, Mr. Singer justly remarks, that the machine employed ought to be such as will furnish a constant stream of sparks; if a plate machine, it ought to be two feet in diameter; if a cylinder machine, not less than ten inches, and fourteen if possible. Machines called medical electrical machines, are sometimes made on a very small scale, and hence the application of them only produces trouble, waste of time, and final disappointment.

265. In connexion with a *powerful* electrical

machine, the auxiliary apparatus requisite for medical purposes are the following:—A jar fitted up with Lane's electrometer, by which shocks may be given of any required force. A pair of directors, each consisting of a glass handle, surmounted by a brass cap with a wire of a few inches in length, having a ball screwed on its extremity, which may be occasionally unscrewed and a wooden point substituted for it. When shocks are given by means of these directors, they must be applied at the opposite extremities of the part through which the charge is required to pass; and being respectively connected by conducting wires, the one with the outside of the jar and the other with the receiving ball of the electrometer previously placed at the requisite distance, the jar may be set to the machine, which is then put in motion until any required number of shocks has been given.

266. The insulated director is also employed to give sparks, being held by its glass handle, and its ball previously connected with the conductor by a fine chain being brought near the patient, or rubbed lightly over a piece of flannel or woollen cloth laid on the affected part. When the eye or any delicate organ is electrified, the ball of the insulated director is unscrewed and the wooden point applied, at the distance of about half an inch from the part. The stream of electricity which passes from the point, in such cases, produces rather a pleasant sensation than otherwise.

267. An insulated stool is sometimes employed; it should be of sufficient size to receive a chair upon it, with a resting place in front of the chair for the feet. The patient being placed on the insulated chair, and connected with the conductor of the machine by means of a chain, sparks may be drawn from any part of the body by a person who stands on the ground and presents a brass ball to it.

268. The following enumeration of instances of disease in which electricity has been successfully applied, is given by Mr. Singer as established on good authority:—1. Contractions. Those only that depend on the affection of a nerve; and in many of these it has been employed without effect, whilst in others of long duration immediate relief has been obtained. 2. Rigidity. Very frequently relieved, but usually requiring some perseverance in the application, to complete the cure. 3. Sprains, relaxation, &c. Electricity may be applied in all these cases with good effect, but its application should be deferred until the inflammation has subsided. 4. Indolent tumors. Strong sparks, and slight shocks, are often effectual. The most numerous cases are those of scirrhous testicle; and there are some instances of the successful dispersion of scirrhous induration of the breast. 5. Mr. Carpue states, that electricity is a good preventive against chilblains; and mentions two instances in which they were removed by the action of electrical sparks. 6. Epilepsy. In several instances of persevering application, not one successful case occurred. 7. Deafness. Sparks thrown on the mastoid process, and round the meatus auditorius externus, and drawn from the same parts on the opposite side, usually afford relief; and about one in five are permanently cured. 8. Opacity of the cornea. This is sometimes cured by the long continued action of electricity thrown for ten minutes a day on the eye by a wooden point. When caused by the small-pox, it is said to yield most readily. 9 Gutta serena. The method of electrifying for opacity of the cornea has been successful in some instances of gutta serena; but there are numerous unsuccessful cases. 10. Amenorrhæa. Cases of suppressed menstruation are generally relieved by sparks and slight shocks; but in retention of the menses electricity has been tried without success. 11. Knee cases. In instances of pain and swelling of the knee, the application of sparks has been effectual in about one case in ten. 12. Chronic rheumatism. Very numerous are the instances of success; the usual application is by sparks, for ten or fifteen minutes every day. In recent cases, a few days is sometimes sufficient; but in those of long standing, very considerable perseverance is often required. 13. Acute rheumatism. In one case out of six a cure was effected in about a month by the application of electricity. 14. Palsy. Moderate shocks, with sparks, have been occasionally successful in about one case of paralysis in every fourteen that have been tried. 15. St. Vitus's dance has been frequently relieved by electricity. There are indeed scarcely but few diseases in which some successful instances of its application are not recorded; but we are still in want of a scientific examination of the statements that have been made on this subject.

269. It appears that the nerves are most powerfully affected by electricity, since the effect of a discharge sent through the body is always most conspicuous in their direction. When the charge of a battery is sent through the head of a bird, the optic nerve is generally found to be injured, and often completely destroyed; a like discharge sent through a larger animal is found to produce a universal protraction of strength, with trembling and depression. Mr. Singer says he once accidentally received a considerable charge from a battery, through the head, which produced the sensation of a violent but universal blow, followed by a transient loss of memory and indistinctness of vision, but was unattended by any permanent injury.

270. Mr. Morgan, who paid considerable attention to medical electricity, has remarked, that if the diaphragm be made to form part of the circuit of a coated surface equal to two feet, fully charged, the lungs make a sudden effort, which is followed by a loud shout; but that if the charge be small, it never fails to produce a violent fit of laughter; and that even those whose calmness and solemnity are not easily disturbed by ludicrous occurrences, are seldom able to withstand the powers of electricity. The first effect of a strong charge on the diaphragm is frequently followed by involuntary sighs and tears, and sometimes by a fainting fit If the charge be passed through the spine, it produces a degree of weakness in the lower extremities; so that if a person be standing at the time, he sometimes drops on his knees, or falls prostrate on the floor.

271. Numerous cases of the successful application of electricity as a medical agent have been published by different authors; Mr. Cavallo has related some of a very striking nature, as have also Mr. Carpue, and Mr. Ferguson, whose testimony stands high in consequence of the candor and unaffected simplicity of their narrations. To the above-mentioned names we must add the name of Mr. La Beaume, who has recently published an excellent little work on the Application of Galvanic Electricity in the cure of chronic diseases; to these works the reader is referred for more ample information on the subject than our limits will allow us to give.

## PART IV.

### ATMOSPHERICAL ELECTRICITY.

272. In the preceding parts of this article we have had occasion to make several references to the identity of lightning and the electricity excited by artificial means; we now proceed to show, by a selection of strictly appropriate experiments, that that agent which is ever active in the atmosphere which surrounds our earth, and is occasionally producing some of the most astonishing, and awfully grand phenomena of nature, is nothing more than a vast explosion of accumulated electricity.

273. The discovery of this important fact was by no means an instantaneous thing; even some modern writers on philosophy appear to have formed opinions on the nature of lightning essentially incorrect; and this is the more remarkable when it is considered that, so long ago as the days of the abbé Nollet, such remarks as the following should have been published, and read, and verified by actual experiment soon after. 'If,' said the abbé, 'any should take upon him to prove, from a well-connected comparison of phenomena, that thunder is in the hands of nature what electricity is in ours; that the wonders we now exhibit at pleasure are little imitations of those great effects which frighten us; and that the whole depends on the same mechanism:—if it could be shown, that a cloud prepared by the action of the winds, by heat, by a mixture of exhalations, &c. is, when opposite to a terrestrial object, that which an electrified body is, when at a certain distance from one that is not electrified; I confess this idea, if it were well supported, would afford me much pleasure; and to support it, how many specious reasons present themselves to a man well versed in electricity. The universality of the electric matter, the rapidity of its action, its inflammability, and its activity in inflaming other bodies; its property of striking bodies externally and internally, even to their smallest parts, the remarkable example we have of this effect in the Leyden experiment, the idea we may legitimately form in supposing a greater degree of electric power, &c. All these points of analogy, which I have for some time meditated, begin to make me believe that one might, by taking electricity for a model, form to one's-self, in relation to thunder and lightning, more perfect and probable ideas than any that have been hitherto offered.'

274. This was certainly a bold hypothesis; highly creditable to the judgment of the author, and affording no obscure intimation that electricity was about to make some unprecedented degree of progress; but to Dr. Franklin undoubtedly belongs the honor of accomplishing, by actual experiment, all that the abbé Nollet's penetrating sagacity led him to speak of in the words just quoted. In a series of letters to one of the members of the Royal Society, the Dr. first gave in detail an hypothesis to explain the phenomena of thunder and lightning by the known properties of electricity, which was soon followed by a demonstration of its truth in the most remarkable experiment ever made.

275. The following are the leading points of resemblance which Dr. Franklin observed to obtain between the electricity of the atmosphere and that which is produced by artificial means. (1.) The zig-zag appearance of the lightning is exactly the same as that of a strong electric spark when it passes through a considerable interval of air. (2.) Lightning generally strikes such bodies as are high and prominent, as the summits of high hills, the tops of lofty trees, high towers, spires, masts of ships, points of spears, &c. and the electric fluid always passes through the most prominent parts, when striking from one body to another. (3.) Lightning is observed to strike most frequently into those substances that are good conductors of electricity, such as metals, water, and moist substances; and to avoid those that are non-conductors. (4.) Lightning inflames combustible bodies. The same is effected by electricity. (5.) Metals are melted by a powerful charge of electricity. This phenomenon is one of the most common effects of a stroke of lightning. (6.) The same may be observed of the fracture of brittle bodies, and of other expansive effects common to both causes. (7.) Lightning has been known to strike people blind. Dr. Franklin found, that the same effect is produced on animals when they are subjected to a strong electric charge. (8.) Lightning destroys animal life. Dr. Franklin killed turkeys of about ten pounds weight, by a powerful electric charge. (9.) The magnetic needle is affected in the same manner by lightning and by electricity, and iron may be rendered magnetic by both causes. The phenomena are, therefore, strictly analogous, and differ only in degree; and, if an electrified gun-barrel will give a spark, and produce a loud report at two inches distance, what effect may not be expected from perhaps 10,000 acres of electrified cloud? And is not the different extent of these conductors, equal to the different limit of their effects?

276. Reasoning on these strong resemblances, Franklin formed the design of erecting a conducting rod by which the lightning might be drawn from the clouds, and thus afford an opportunity of ascertaining its identity with the electric fluid. 'The electric fluid,' said he, 'is attracted by points; we do not know whether this property be in lightning; but since they agree in all the particulars in which we can already compare them, it is not improbable that in this they likewise agree. Let the experiment be made.' And doubtless he would himself have made it before

any other person could have anticipated him in it, but waiting for the erection of a spire in Philadelphia, and his opinions becoming known, he was anticipated by the French philosophers D'Alibard and De Loe, who erected a rod such as Franklin had suggested, and succeeded in the experiment. But the honor and merit of the idea were not to be thus rent from Franklin; for in the mean time, and without any knowledge of the attempts of the French electricians, it occurred to him that, by sending up a kite, he could obtain a readier access to the clouds than by the longest rod which he could raise on the highest spire. He made the attempt, and, as we have before shown, was successful; and thus was the identity of lightning with electricity satisfactorily established.

277. In treating of the electricity of the atmosphere it may be proper to begin with the more gentle and silent manifestations of it: thence to proceed to the consideration of its accumulated discharges in meteors and thunder-storms; and then make some remarks on its general influence on the surface of our earth.

278. From long, correct, and patient investigation, it has been proved that the various luminous phenomena that appear in our atmosphere, are to be resolved into the agency of electricity, although it must be allowed that, with all our knowledge of those effects, they are still surrounded with such difficulties, that scientific men are not quite of one mind respecting them. Of this description the aurora borealis, or northern light, must be allowed to be an instance.

279. The aurora borealis, or, as the same appearance is commonly termed, streamers, and in the Shetland Isles, the merry dancers, can seldom be seen in the southern parts of the kingdom; and, even when seen there, the appearance is far less brilliant than in northern latitudes, where this wonderful phenomenon is the constant attendant of clear evenings, affording a great relief to the inhabitants, amid the gloom that would otherwise attend their dreary winter nights.

280. Of this kind of meteor, the late Mr. George Adams has given the following concise account in his valuable lectures:—The appearances of the aurora come under four different scriptions. (1.) A horizontal light, like the aurora, or break of day. (2.) Fine, slender, luminous beams, well defined, and of dense light. These often continue a quarter, a half, or a whole minute, apparently at rest, but oftener with a quick lateral motion. (3.) Flashes pointing upward, or in the same direction with the beams, which they always succeed. These are only momentary, and have no lateral motion; but they are generally repeated many times in a minute. They appear much broader, more diffuse, and of a weaker light than the beams: they grow gradually fainter till they disappear; and sometimes continue for hours, flashing at intervals. (4.) Arches, nearly in the form of a rainbow: these, when complete, go quite across the heavens, from one point of the horizon to the opposite point.

281*. When an aurora happens, these appearances seem to succeed each other in the following order:—(1.) The faint rainbow-like arches; (2.) The beams; and (3.) The flashes. As for the northern horizontal light, it appears to consist of an abundance of flashes of beams, blended together by the situation of the observer.

The beams of the aurora borealis appear at all places to be arches of great circles of the sphere, with the eye in the centre; and these arches, if prolonged upwards, would all meet at one point.

The rainbow-like arches all cross the magnetic meridian at right angles. When two or more appear at once they are concentric, and tend to the east and west; also the broad arch of the horizontal light tends to the magnetic east and west, and is bisected by the magnetic meridian; and when the aurora extends over any part of the hemisphere, whether great or small, the line separating the illuminated part of the hemisphere from the clear part is half the circumference of a great circle crossing the magnetic meridian at right angles, and terminating in the east and west: moreover, the beams perpendicular to the horizon are only those on the magnetic meridian.

That point in the heavens to which the beams of the aurora appear to converge, at any place, is the same as that to which the south pole of the dipping-needle points at that place.

The beams appear to rise above each other in succession; so that, of any two beams, that which has the higher base has also the higher summit.

Every beam appears broadest at or near the base, and to grow narrower as it ascends; so that the continuation of the bounding lines would meet in the common centre to which the beam tends.

281*. Now between these appearances and those of electricity, under certain circumstances, there are several points of close resemblance. For it is found by a simple experiment that, when the electric fluid is made to pass through rarefied air, it exhibits a diffused luminous stream, which has all the characteristic appearances of the northern lights. There are to be seen the same varieties of color and intensity, the same undulating motion and occasional corruscations; the streams exhibit the same diversity of character, at one moment minutely divided into ramifications, and at another beaming forth in one body of light, or passing in well defined flashes; and, when the rarefaction is high, various parts of the stream assume that peculiar glowing color which occasionally appears, and which, on the whole, leaves but little room to doubt that the phenomena are produced by the passage of electricity through the upper regions of the atmosphere, although at the same time it ought to be mentioned that this opinion has been doubted by some since the accomplishment of the recent voyages of discovery to the polar regions.

282. It has been stated above, that this most beautiful phenomenon is seldom witnessed by the inhabitants of the southern parts of the kingdom; to them, therefore, at all events, as well as to those who have witnessed the aurora borealis in a fainter degree, the following extract from

Mr. Dalton's description of one which he witnessed must be acceptable. It is taken from his Meteorological Essays.

283. 'Attention,' says Mr. Dalton, 'was first excited by a remarkably red appearance of the clouds to the south, which afforded sufficient light to read by, at eight o'clock in the evening, though there was no moon, nor light in the north. Some remarkable appearance being expected, a theodolite was placed to observe its altitude, bearing, &c.

'From half past nine to ten o'clock, P. M., there was a large, luminous, horizontal arch to the southward, almost exactly like those which we see in the north; and there were some faint concentric arches northward. It was particularly noticed that all the arches seemed exactly bisected by the plane of the magnetic meridian. At half past ten o'clock streamers appeared very low in the south-east, running to and fro from west to east; they increased in number, and began to approach the zenith apparently with an accelerated velocity; when all on a sudden the whole hemisphere was covered with them, and exhibited such an appearance as surpasses all description. The intensity of the light, the prodigious number and volatility of the beams, the grand intermixture of all the prismatic colors in their utmost splendor, variegating the glowing canopy with the most luxuriant and enchanting scenery, afforded an awful, but at the same time the most pleasing and sublime spectacle. Every one gazed with astonishment; but the uncommon grandeur of the scene only lasted about one minute; the variety of colors disappeared, and the beams lost their lateral motion, and were converted into the usual flashing radiations; but even then it surpassed all other appearances of the aurora, in that the whole hemisphere was covered with it.

284. 'Notwithstanding the suddenness of the effulgence at the breaking out of the aurora, there was a remarkable regularity in the manner. Apparently a ball of fire ran along from east to west, and the contrary, with a velocity so great as to be barely distinguishable from one continued train, which kindled up the several rows of beams one after another: these rows were situated before each other with the most exact order, so that the bases of each row formed a circle crossing the magnetic meridian at right angles; and the several circles rose one above another in such sort, that those near the zenith appeared more distant from each other than those near the horizon, a certain indication that the real distances of the rows were either nearly or exactly the same. And it was further observable that, during the rapid lateral motion of the beams, their direction in every two nearest rows was alternate; so that whilst the motion in one row was from east to west, that in the next was from west to east.

285. 'The point to which all the beams and flashes of light uniformly tended was, in the magnetic meridian, and, as near as could be determined, between 15° and 20° south of the zenith. The aurora continued, though diminishing in splendor, for several hours. There were several meteors seen at the same time; they appeared below the aurora, and unconnected with it.' This brilliant display of the aurora borealis Mr. Dalton witnessed on the 13th of October, 1792.

286. Similar appearances are often seen towards the south pole, but they are said to be unattended with the same variety of color; they are called aurora australis. A very feeble, though certainly a pleasing imitation of this remarkable phenomenon may be thus exhibited:—Take the glass vessel represented in fig. 9, resembling a Florence flask, and fitted with a valve at top by which it may be exhausted of its air: when exhausted, and rubbed in the common manner used to excite electrics, it will appear luminous within, being full of a flashing light which plainly resembles the aurora borealis, or northern light. This phial may also be made luminous, by holding it by either end, and bringing the other end to the prime conductor; in this case all the cavity of the glass will instantly appear full of flashing light, which remains in it for a considerable time after it has been removed from the conductor: instead of the glass phial a glass tube exhausted of air and hermetically sealed may be used, and perhaps with more advantage. The most remarkable circumstance of this experiment is, that if the phial or tube, after it has been removed from the conductor (and even several hours after its flashing light has ceased to appear), be grasped with the hand, strong flashes of light will immediately appear within the glass, which often reach from one end to the other.

287. The next form of atmospherical electricity that claims our attention is that which it assumes in those meteors, to which the vulgar name of falling, or shooting stars, has been given. The aurora borealis, we have said, is caused by streams of the electric fluid passing rapidly through the higher regions of the air; and these phenomena of which we are now speaking, are, in all probability, portions of the same matter moving through a more resisting medium, since they are always observed to be in comparatively small altitudes.

288. These meteors vary considerably in their size and color, and also in the rapidity of their motion; they move in various directions, but chiefly incline towards the earth. They occur in different states of the atmosphere, but prevail most in clear frosty nights, and at other times when the winds are easterly, and the sky clear; in the intervals also of showery weather they are frequent, and on summer evenings, when well defined clouds are seen floating in a clear atmosphere.

289. In favorable states of the atmosphere, Mr. Singer remarks, these appearances are seen to succeed each other so rapidly, that he has often counted thirty of them in the space of an hour, and, on some occasions, twice that number. The frequency of their occurrence, he thinks, indicates that they are produced by some of the usual atmospherical changes, and that the circumstance of their explosion being unattended by the fall of stones, renders it almost certain that their nature is essentially different from that of the large meteors.

290. The same gentleman offers the following as arguments in favor of the electrical origin of

these meteors:—(1.) The light of falling stars is similar to the light of the electric spark. (2.) They occur as frequently and as irregularly as other electrical changes in the atmosphere. (3.) Their motion, like that of electricity, is exceedingly rapid; and the longest interval through which they strike, is traversed in an interval of time too minute to admit of measurement. (4.) They occur most frequently during, or near to those changes of weather, that are known to influence the electrical state of the atmosphere. (5.) Their direction is never constant; they occur in every part of the atmosphere, and move in almost every direction; such is also the case with lightning. (6.) The appearance of falling stars may be accurately imitated by electricity; and the circumstances on which the success of such experiments depend, are such as are likely to occur in the production of the natural phenomena.

291. Hence if electricity be passed gradually through an exhausted receiver, it assumes, as we have already seen, the appearance of the aurora borealis; but if an accumulation of it be suddenly transmitted, it will pass through the receiver with the straightness and brilliance of a shooting star. This appearance also occurs most readily when the receiver is but partially exhausted. The imitation therefore of these two phenomena seems evidently to require the same conditions for its production, as those which obtain in nature; that is to say, the aurora occurs in those regions where the air is highly rarefied; and the most complete imitation of it is effected in a thoroughly exhausted receiver; falling stars take place where the air is much more dense, and the imitation of them requires a medium which offers from its density considerable resistance.

292. Different writers on electricity have proposed different methods of producing an imitation of these meteors, but that of Mr. Singer is undoubtedly the most effectual as well as the most elegant. He used for this purpose a glass tube, five feet in length, and about five-eighths of an inch in diameter, mounted with a brass cap at each end, and fitted at one extremity with a valve to allow of its being exhausted. When this tube was exhausted, no spark would pass through it except in a very diffused state; but when the charge of a very large jar was employed, a brilliant spark was obtained through the whole length of the tube, resembling in appearance a shooting star.

293. There are various other luminous appearances of the electricity of the atmosphere, which might with propriety be described here, such as those frequently observed on the tops of spires, and the masts of ships, and occasionally on the points of spears, &c.; but we must not enlarge, and shall only observe respecting them, that they seem analogous to the light that is observed on the point of any slender and prominent conductor, when placed within an electrical atmosphere, or brought near to an excited electric. These, and similar phenomena observable in the atmosphere, have now been sufficiently treated for this department of our work. 58

294. But the most magnificent display of atmospherical electricity is to be seen during a thunder-storm, the particular phenomena of which we must now proceed to notice. We have already seen the most satisfactory ground for the conclusion that lightning and electricity are identical, and have adverted to most of the known means by which the latter are produced: and if the analogy be correct in the one case we may conclude it to be so in the other, although with some differences perhaps, which have hitherto been, and which may for ever remain inaccessible to human observation.

295. If then, it be asked, whence comes the electricity of the atmosphere? it may in reply be said, that from the sum of our knowledge respecting meteorological phenomena, there appears good reason to conclude that the causes which produce artificial electricity, are all in full operation in the masses of vapor, among which natural electricity appears active.

296. This opinion is maintained by several eminent practical electricians of the present day; it was warmly espoused by the late Mr. Singer, who advanced in support of it the following positions:—(1.) That the electrical phenomena of the atmosphere take place, in all climates, to the greatest extent, about the period of the greatest degree of heat, when the rays of the sun have caused a considerable accumulation of vapor. (2.) Where this cause operates to the greatest extent, as, for instance, within the tropics, natural electricity is produced on the largest scale. (3.) When the natural source of evaporation is assisted by collateral causes, electrical changes occur with astonishing activity, as in the eruption of a volcano, or the heat imparted to the air in its passage over large extents of hot sands, as those of Africa. (4.) By the action of winds, currents of air of different temperatures are often mixed,—so that such as have been heated and charged with moisture, become suddenly cooled, thus occasioning a precipitation of water, and the occurrence of electrical changes. This is often witnessed on the coast of Guinea during the existence of the harmattan. (5.) These electrical changes are every where most frequent when the causes of evaporation and condensation suddenly succeed each other.

297. After advancing several cogent arguments in favor of the above facts, and noticing in a very candid manner some objections urged against the theory they are intended to support, Mr. Singer concludes with the following truly appropriate and judicious observations:—'Although the immediate causes by which the various phenomena of the atmosphere are produced, be still far beyond our comprehension; yet the connexion of their several effects is a sufficient demonstration that they are not purely mechanical, but subservient to the direction of supreme power and intelligence. By this means the most simple arrangement becomes the source of sublime effects. The process of evaporation which modifies the action of the sun's rays, and conveys to every part of the earth's surface a source of fertility, does at the same time diversify the appearance of the atmosphere by an endless variety of imagery, enlivening the horizon with the most brilliant and glowing tints

and in all probability effecting those electrical changes, which are the precursors of the most magnificent phenomena in nature.'

298. The phenomenon of the thunder-storm itself is always one of intense interest to the electrician. Some writers on the subject of electricity have furnished us with very beautiful descriptions of a thunder-storm, but of all these we feel disposed to give the preference to that of Sig. Beccaria, as containing a neat and unvarnished statement of facts, instead of being decorated with the effusions of a poetical imagination.

299. 'Thunder-storms,' says Beccaria, 'generally happen when there is little or no wind; and their first appearance is marked by one dense cloud, or more, increasing very fast in size, and rising into the higher regions of the air; the lower surface black, and nearly level, but the upper finely arched, and well defined. Many of these clouds seem frequently piled one upon another, all arched in the same manner; but they keep continually uniting, swelling, and extending their arches.

300. 'At the time of the rising of this cloud, the atmosphere is generally full of a great number of separate clouds, motionless, and of odd and whimsical shapes. All these, upon the appearance of the thunder-cloud, begin to move towards it, and become more uniform in their shapes as they approach, till, coming very near the thunder cloud, they mutually stretch towards one another, immediately coalesce, and together make one uniform mass. But sometimes the thunder-cloud will swell, and increase very fast, without the conjunction of these adscititious clouds, the vapors of the atmosphere forming themselves into clouds wherever it passes. Some of the adscititious clouds appear like white fringes at the skirts of the thunder-cloud, but these are continually growing darker and darker as they approach or unite with it.

301. 'When the thunder-cloud is grown to a great size, its lower surface is often ragged, particular parts being detached towards the earth, but still connected with the rest. Sometimes the lower surface swells into various large protuberances, bending uniformly towards the earth. When the eye is under the thunder-cloud, after it is grown larger, and well formed, it is seen to sink lower, and to darken prodigiously; at the same time that a number of adscititious clouds (the origin of which can never be perceived) are seen in a rapid motion, driving about in every direction under it. While these clouds are agitated with the most rapid motions, the rain generally falls in the greatest plenty; and, if the agitation is exceedingly great, it commonly hails.

302. 'While the thunder-cloud is swelling, and extending its branches over a large tract of country, the lightning is seen to dart from one part of it to another, and often to illuminate its whole mass. When the cloud has acquired a sufficient extent, the lightning strikes, between the cloud and the earth, in two opposite places, the path of the lightning lying through the whole body of the cloud and its branches. The longer this lightning continues the rarer the cloud grows, and the less dark is its appearance, till at length it breaks in different places, and displays a clear sky.'

303. From the circumstance of almost constant injury attending thunder-storms it is impossible to witness one without some feelings of personal danger; in this case attention to the following observations may often be of service in relieving the mind from unnecessary fear, or in suggesting the necessary steps to be taken for the prevention of accident.

304. *The Place of the Explosion.*—The electrical explosion generally takes place in the air, and at a considerable height; but in many instances it happens between the clouds and the earth. In most instances, perhaps, the lightning descends from the clouds to the earth, and the explosion is then called the descending stroke: but in some cases it is known to pass from the earth to the clouds, and is then termed the ascending stroke: of the latter kind appears to have been the explosion which took place on the Malvern hills, in the summer of 1826, and which was attended with such melancholy consequences. A very curious instance of the ascending stroke is related by G. F. Richter, in his work on thunder. He informs us that in the cellar belonging to the Benedictine monks of Fontigno, while the servants were employed in pouring into a cask some wine which had been just boiled: a fine light flame appeared round the funnel, and they had scarcely finished their operation when a noise like thunder was heard; the cellar was instantly filled with fire; the cask was burst open, although hooped with iron, the staves were thrown with prodigious violence against the wall; and, on examination, a hole of three inches diameter was found in the bottom of the cask.

305. *The Distance of the Thunder Cloud.*—This is a point of some importance to be determined; and the interval between the flash and the commencement of the report furnishes the data necessary for the calculation. Sound travels at the rate of 1142 feet in a second: consequently, by a watch which beats and points the seconds, the distance of the cloud is easily ascertained, for the flash and the sound are really contemporaneous; and the former requires hardly any perceptible lapse of time to travel through any ordinary distance. Thus, for example, suppose the flash to occur five seconds before the sound is heard, then $1142 \times 5 = 5710 = 1$ mile 430 feet, the distance of the explosion from the place of the observer. So far this calculation is very gratifying, but it is no criterion of safety, for it only indicates the distance of a discharge that has taken place: the next may render the observer incapable of observation.

306. *Indications of real danger.*—During a thunder-storm there are certain circumstances which afford strong indications of actual danger. Such, for instance, are a rapid approach of the charged cloud, and the almost perpendicular direction of the lightning. When the cloud seems to be vertical as soon as it is formed, we are exposed to its utmost fury; and, when it increases in darkness as it approaches, it also indicates great danger. When the flashes strike perpen-

dicularly, it is a certain indication that the clouds are at that height from which they may readily strike into the ground. It is also supposed that the appearance of two flashes at once indicates danger; but this is uncertain, as it may arise from an optical illusion, or the interposition of a cloud.

307. The precautions generally offered by writers on electricity, as necessary for the safety of those who are exposed to the action of a thunder-storm, may be thus enumerated. Shelter should not be taken under trees, hedges, &c.; for, should they be struck, such situations are particularly dangerous; at the same time a person is much safer at about thirty or forty feet from such objects than at a greater distance, as they are likely to operate as conductors. Large portions of water also ought to be carefully avoided if possible, and even streamlets that may have resulted from recent rain; these are good conductors, and the height of a human being connected with them, may sometimes determine the course of the lightning. In a house the safest situation is considered to be the middle of the room; and this situation may be rendered still more secure bystanding on a glass-legged stool: but, as such an article is not in the possession of many people, a hair mattress, or a thick woollen hearth rug makes a very good substitute. It is very injudicious to take refuge, as some persons do, in the cellar during a thunder storm, since the discharge is often found to be from the earth to the clouds, and many instances are recorded of buildings that were struck having sustained the greatest injury about the basement story. But, whatever situation is chosen, the greatest care should be taken to avoid going near the fire-place, since the chimneys are most likely to attract the fluid, and even if there be no fire in the grate, at the time, it should be remembered that soot is a powerful conductor. The same caution is necessary with respect to all large metallic surfaces; gilt furniture, bell wires, &c.

308. But the most important and useful application that has ever yet been made of the discoveries of the electrician is in the method of securing buildings, ships, &c., from the effects of lightning. To the ingenuity of Dr. Franklin the world is indebted for this invention, as well as for his discovery of the identity of lightning and common electricity. He first proposed to erect a perfectly continuous metallic rod by the side of any building intended to be secured from injury by lightning: this rod was to be pointed at each extremity; to rise some feet above the highest part of the building, and to extend some feet below the foundation, in moist ground, or water if practicable. By such a precaution, he conceived that the house could never receive any damage; for, whenever the lightning should happen to fall upon it, it is evident that the conductor, being of metal, and higher than any part of the building, would naturally attract it, and, by conducting it to the ground, prevent that building from receiving any damage; it being well known that electricity always strikes the nearest and best conductors.

309. As this subject is of the utmost importance, we shall here quote the very concise and judicious observations of Mr. Cava o respecting it. Speaking of the proposal of Dr. Franklin, which we have just noticed, he proceeds to remark, that the reasonableness and truth of such an assertion has been confirmed by numberless facts, and the practice of raising such conductors has been found exceedingly useful, particularly in hot climates, where thunder storms are very frequent, and the damage occasioned by the same too often experienced.

310. In regard to the construction of such conductors, there have been some controversies among electricians; and the most advantageous manner of using them has not, without a great many experiments, and but very lately, been ascertained. Some philosophers have asserted, that such conductors should terminate in an obtuse end, that they might the less invite the lightning from the clouds; for such an end will not attract electricity from so great a distance as a sharp point. But other philosophers have thought a pointed termination to be much preferable to an obtuse one; and their assertion seems, on the following accounts, to be better founded.

311. 'A sharp-pointed conductor, it is true, will attract electricity from a greater distance than one with an obtuse point, but at the same time will attract and conduct it very gradually, or rather by a continued stream, in which manner a remarkably small conductor is capable of conducting a very great quantity of electricity; whereas an obtusely terminated conductor attracts the electricity in a full separate body, or explosion, by which it is often made red-hot, melted, and even exploded in smoke, and by such a quantity of electricity as perhaps would not have at all affected it, if it had been sharply pointed.

312. 'A sharp-pointed conductor certainly invites the matter of lightning easier than an obtuse one; but to invite, receive, and conduct it in small quantities, never endangers the conductor; and the object of fixing a conductor to a house, is to protect the house from the effects of, and not the conductor from transmitting the lightning.

313. 'It is an observation much in favor of sharp-pointed conductors, that such steeples of churches, and edifices in general, as are terminated by pointed metallic ornaments, have very seldom been known to be struck by lightning; whereas others that have flat terminations and have a great quantity of metal in a manner insulated on the tops, are often struck; and it is but seldom that they escape without great damage.

314. 'Besides these considerations, a sharp-pointed conductor, by the same property of attracting electricity more readily than an obtusely terminated one, may prevent a stroke of lightning, which the latter is incapable of doing.

315. 'A conductor, therefore, to guard a building, as it is now commonly used, should, from several considerations and experiments, consist of one iron rod about three quarters of an inch thick, fastened to the wall of the building, not by iron cramps, but by pieces of wood. If this conductor were quite detached from the building, and supported by wooden posts at

the distance of one or two feet from the wall, it would be much better for common edifices, but it is more particularly advisable for powder-magazines, powder-mills, and all such buildings as contain combustibles ready to take fire. The upper end of the conductor should be terminated in a pyramidal form, with the edges, as well as the point, very sharp: and if the conductor be of iron, it should be gilt, or painted, for two or three feet. This sharp end should be elevated above the highest part of the building (as above a stack of chimneys, to which it may be fastened) at least five or six feet. The lower end should go five or six feet into the ground, and in a direction leading from the foundation; or it would be better to connect it with the nearest piece of water, if any be at hand. If this conductor, on account of the difficulty of adapting it to the form of the building, cannot conveniently be made of one rod, then care should be taken, that where the pieces meet, they be made to come in as perfect a contact with one another as possible; for, as we observed before, electricity finds considerable obstruction where the conductor is interrupted.

316. 'For an edifice of a moderate size, one conductor of the kind already described, is perhaps sufficient; but, in order to secure a large building from sustaining any damage by lightning, there should be two, three, or more conductors, in proportion to the extent of the building.

317. 'In ships a chain has often been used for this purpose, which, on account of its pliableness, has been found very convenient, and easy to be managed among the rigging of the vessel; but, as the electricity finds a great obstruction in going through the several links, so that chains have been actually broken by the lightning, their use is now almost entirely laid aside; and, in their stead, copper wires a little thicker than a goose-quill have been substituted, and found to answer extremely well. One of these wires should be elevated two or three feet above the highest mast in the vessel; this should be continued down the mast, as far as the deck, where, by bending, it should be adapted to the surface of such parts, over which it may most conveniently be placed, and by continuing it down the side of the vessel, it should be always made to communicate with the water.'

318. M. Cavallo gives, with cordial approbation, the following extract from the earl of Stanhope's learned work on electricity:—As requisites for the proper construction of conducting rods for the preservation of buildings from the effects of lightning he directs, (1.) 'That the rods be made of such substances as are the best conductors of electricity. (2.) That the rods be uninterrupted and perfectly continuous. (3.) That they be of a sufficient thickness. (4.) That they be perfectly connected with the common stock. (5.) That the upper extremity of the rods be as acutely pointed as possible. (6.) That it be very finely tapered. (7.) That it be prominent. (8.) That each rod be carried in the shortest convenient direction, from the point at its upper end to the common stock. (9.) That there be neither large nor prominent bodies of metal upon the top of the building proposed to be secured, but such as are connected with the conductor by some proper metallic communication. (10.) That there be a sufficient number of high and pointed rods: and, (11.) That every part of the building be very substantially erected.'

319. For the purpose of illustrating the principle on which the thunder-rod acts, there are some very satisfactory experiments generally employed by lecturers on electricity, which it may be proper here to explain, and before doing which we would just observe, that the charge used on these occasions should be moderate, having found from experience that, in that part of the experiments which is intended to show the effect of interruptions in the conductor, a strong charge has injured the apparatus.

320. The simplest form in which these experiments are made is that known by the name of the *thunder-house*. This is represented by fig 10, where A is a board about three-quarters of an inch thick, and shaped like the gable end of a house. It is fixed perpendicularly upon the bottom board B, upon which the perpendicular glass pillar C D is also fixed, in a hole about eight inches distant from the base of the board A. A square hole, I L M K, about a quarter of an inch deep, and nearly one inch wide, is made in the board A, and is filled with a square piece of wood, nearly of the same dimensions. This board must fit in rather easily, so that the slightest shaking may throw it out. A wire, L K, is fastened diagonally to this square piece of wood. Another wire, I H, of the same thickness, having a brass ball, H, screwed on its pointed extremity, is fastened upon the board A; so also is the wire M N, which is formed into a hook at O. From the upper extremity of the glass pillar, C D, a crooked wire proceeds, having a spring socket F, through which a double-knobbed wire slides perpendicularly, the lower knob G of which falls just above the knob H. The glass pillar D C must not be fixed very tightly into the bottom board; but it must be fixed so as to be pretty easily moved round its own axis, by which means the brass ball G may be brought nearer or farther from the ball H, without touching the part of E F G. When the square piece of wood L M I K, is fixed into the hole so that the wire L K stands in the dotted representation I M, then the metallic communication from H to O is continuous, and the instrument represents a house furnished with a proper metallic conductor; but if the square piece of wood L M I K is fixed so that the wire L K stands in the direction L K, as represented in the figure, then the metallic conductor H O, from the top of the house to its bottom, is interrupted at I M, in which case the house is not properly secured.

320.* Fix the piece of wood, L M I K, so that its wire may be as represented in the figure, in which case the metallic conductor H O is discontinued. Let the ball G be fixed at about half an inch perpendicular distance from the ball H, then, by turning the glass pillar D C, remove the former ball from the latter; by means of a chain connect the wire E F with the wire Q of the jar P, and let another chain, fastened to the hook O, touch the outside coating of the jar. Connect the wire Q with the prime conductor,

and charge the jar; then, by turning the glass pillar D C, let the ball G come gradually near the ball H, and when they are arrived sufficiently near one another, the jar will explode, and the piece of wood, L M I K, will be driven out of the hole to a considerable distance from the thunder-house. In this experiment the ball G represents an electrified cloud; which, when it is arrived sufficiently near the top of the house A, the electricity strikes it; and, as this house is not secured with a proper conductor, the explosion breaks part of it, as is seen by the violent removal of the piece of wood I M.

321. Repeat the experiment with only this variation, viz. that the piece of wood I M is situated so that the wire L K may stand in the direction I M, in which case the conductor H O is not discontinued; and then the explosion will have no effect upon the piece of wood L M, this remaining in the hole unmoved; which shows the usefulness of the metallic conductor.

322. Again, unscrew the brass ball H from the wire H I, so that this may remain pointed. With this difference only in the apparatus, repeat both the above experiments, and it will be found that the piece of wood I M is in neither case moved from its place, nor will any explosion be heard; which not only demonstrates the preference of the conductors with pointed terminations to those with obtuse ends; but also shows that a house furnished with sharp terminations, although not furnished with a regular conductor, is almost sufficiently guarded against the effects of lightning.

323. This apparatus is sometimes made in the shape of a house, as represented by fig. 11; for the sake of distinctness, the side and part of the gable end A C represents that of the thunder-house, and may be used in the same manner with that above described, or more readily by the following method:—Let one ball of the discharging rod touch the ball of the charged jar, and the other knob A of the conductor A C of the thunder-house; the jar will then explode, and the charge will act upon the conductor just mentioned. The conducting wire at the windows *h*, *h*, must be placed in a line. The sides and gable, A C, of the house, are connected with the lower part of the house by hinges, and the building is kept together by a ridge on the roof.

324. To use this model, fill the small tube *a* with gunpowder, and ram the wire *c* a little way into the tube; then connect the tube *c* with a large jar or battery. When the jar is charged, form a communication from the hook at C, on the outside, to the top of the jar, by the discharging rod; the discharge will fire the powder, and the explosion will throw off the roof, with the sides, back, and front, so that they will all fall down together. Fig. 12 represents a small ramrod for the tube *a*, and fig. 13 a pricker for the touch-hole at C. Philosophical and mathematical instrument makers now construct the front of the common thunder-houses as well as the powder-houses above described, with two pieces of wood or windows, which, by being placed in proper situations, the one to conduct and the other to resist the fluid, will illustrate by one discharge the usefulness of good conductors for securing buildings or magazines from the explosion of thunder, as well as the danger of using imperfect ones.

325. The most elegant method of performing this experiment, however, is represented in fig. 14, which exhibits a hollow pyramid of wood, composed of several pieces, having a wire through each, so that their ends may come in contact with each other, as seen at *s*, *s*, *s*. One corner of the pyramid must be made loose as shown at *d*, having the conducting wire passing nearly through it, but not quite so. The wire, passing through the rest of the pyramid, must join (by a chain) the outside coating of a Leyden jar. If the cloud *x* be supported by a wire from the prime conductor, and hang half an inch from the knob *g* of the pyramid; when the jar is charged, a flash will take place between *x* and *g*; the fluid will pass along the wires *s*, *s*, *s*, till it comes to the break at *d*; there an explosion will take place, that will force out the corner piece *d*, and throw down the fabric in separate pieces.

326. The preceding experiments sufficiently illustrate the use of conductors raised on buildings that are much exposed to the effects of thunder-storms; but, that we may not omit any information on the subject that may be deemed useful, we shall just add Mr. Morgan's method of preventing all possible danger in these cases. The plan which Mr. Morgan proposes is that, whilst a house is being built, the foundation of each partition wall should be laid on a strip of lead, or that the strip be fastened to the sides of these partition walls. The strips should be two inches wide, and at least a quarter of an inch thick, and closely connected with each other. A perpendicular strip, on each side of the house, should rise from the conductors to the surface of the ground; whence a strip should be continued round the house, and carefully connected with water-pipes, &c. The strips on the sides of the house should then be continued to the roof, which ought to be guarded in the same manner as the foundation. The top should be surrounded by a strip, which should be connected with every edge and prominence, and be continued to the summit of each separate chimney. It is particularly necessary to guard the chimneys; for Mr. Morgan mentions a case, in which a house that had been guarded in most respects, according to the preceding directions, except that the chimneys were unprotected, was struck with lightning, which entered by one of the chimneys: here it spent its fury; but the chimney falling on the roof, did considerable damage. The principal objection to this method is the expense attending it; but this may be in a great measure avoided, by making proper use of the leaden pipes, gutters, and copings, which belong to most houses.

327. Before leaving the subject of conducting rods, we think it due to the ingenious professor Leslie of the University of Edinburgh, to notice an article on electrical theories, published by him in the Edinburgh Philosophical Journal for July, 1824. In this paper Mr. Leslie endeavours to show that thunder-rods are of no use whatever in the way of protecting buildings against the

effects of lightning. But lest we should in any degree misrepresent the professor's sentiments, by giving an abridged statement of them, we shall quote his own words :—

328. 'But, whatever speculations we may form in regard to electrical light, and the mode in which the point and the knob produce their different effects, we must admit that the electricity is never communicated, in any perceptible degree, to a remote and unconnected body, but by means of a current of air; and this established principle will enable us to estimate the real effects of conductors or thunder-rods.

329. 'When two portions of air, near the point of saturation, and of different temperatures, are mixed, a quantity of the dissolved vapor is precipitated, and resumes its aqueous state. By this conversion the mass acquires electricity; and the consequent repulsion exerted, tends to disperse the minute globules of water, which will float in the atmosphere, or rather, will descend with that slow motion which is sufficient to occasion a resistance on their large surface equal to their gravitation. If the cloud thus generated reach the ground, it will soon communicate its electricity. If it be suspended at some height, the electrified air will stream from it in all directions; and if its formation be gradual, this discharge may suffice to waste its force. But when a vast cloud is suddenly formed, the aërial emission hardly impairs its electricity; and, as it is carried along, it continually approaches, by its attraction, to the surface, which assumes an opposite electricity; the air now rushes with violence, and the cloud bends faster downwards, till at last its lowest verge reaches the ground, and a total discharge is made. The magnitude of the stroke will evidently depend on the extent of the aqueous mass, the suddenness of its precipitation, and the rapidity of its descent.

330. 'The air, which streams in all directions from the cloud, is dissipated among the more remote portions, and thus gradually communicates its electricity. Hence, from the wide dispersion, owing to the distance, the electricity of the air at the surface of the earth must be weak; and, even in the midst of the storm, the electrometer is less affected than if placed only a yard behind the prime conductor. Yet the action of the thunder-rod is confined entirely to the air which immediately surrounds it, and the quantity of aërial current which it can produce, must evidently be inferior to what is directed to the point, when held several feet from the conductor of an electrical machine. But, to avert the stroke, it would be necessary that the whole air between the surface and the cloud should be brought successively in contact with the top of the rod. Nor is this all; for the air will be constantly replaced by other electrified portions emitted from the cloud. The effect of the thunder-rod is therefore, comparatively, but a drop in the ocean. It may be easily shown that, however pointed and tapered, it would require 1000 years to guard at the distance of 100 yards; if terminated with a knob, it may take 10,000 years. Such are the vaunted performances of thunder-rods, and such the advantages of their different forms! Nor can we appeal to experience; it never can be proved that thunder-rods have produced beneficial effects, but several instances may be cited where they have afforded no sort of protection Nay, we shall be convinced, that fully an equal proportion of the buildings armed with such supposed safeguards have been struck with lightning. But if thunder-rods are useless, they are also innocent; and, that they provoke the shaft of heaven, is the suggestion of superstition rather than of science. The cloud exerts an attraction, indeed, upon the surface of the ground, but the force depends solely on the distance, and is not, in the least degree, affected by the shape or quality of the substances below. It rolls towards the nearest and most elevated objects, and strikes indiscriminately a rock, a tree, or a spire.

331. 'If a thunder-rod be then a harmless, though idle, appendage to a house, why awaken uneasy apprehensions? It might at least inspire confidence in the moment of danger; and if happiness consists merely in idea, why not indulge delicious error?—Yet, though the inevitable stroke cannot be turned aside, its destructive effects may be lessened; and an investigation of the real action of thunder will conduct us to the proper principles.'—*Ed. Phil. Jour.* No. XXI. pp. 25. 28.

332. The above theory is certainly ingenious and worthy of attention, but it wants confirmation in another way than that attempted by its author. We would, with all deference to Mr. Leslie's well-known abilities, ask if he would advise large fires to be kept up round powder magazines for the purpose of preventing them from being struck by lightning? We do not know, either, why *he* advises that they should have copper conductors raised near them? nor why, to save ships, ribands of copper should be extended from the masts to the keel, since he affirms that the idea of *diverting* or dissipating the storm is *wholly chimerical.*

### Spontaneous Electricity of the Atmosphere.

333. Very numerous are the observations which have at different times been made by able observers on this branch of atmospherical electricity. We cannot here enter minutely into these, and shall therefore only offer an outline of their general results.

334. The earliest observations of this nature appear to have been those of Monnier; his experiments were made with an apparatus, which consisted of a pole thirty-two feet in height, insulated in a piece of turf, having at its top a strong glass tube, to which a tube of tinned iron was attached, and which terminated in a point. About the middle of this tube there was fastened a fine iron wire about fifty lines long, which, without touching any other body, was connected with a silk cord stretched horizontally. He found although the atmosphere was constantly electrified more or less, yet that in dry weather the electricity increased from sun-rise, when it was weakest, till about four o'clock in the afternoon, at which time it was strongest, gradually diminishing from that time till the dew began to fall, after which it diminished till midnight. The

same results were afterwards obtained by Saussure and Beccaria.

335. The abbé Mazeas made several observations with an atmospherical apparatus, consisting of an iron wire 370 feet long, raised about ninety feet from the ground, and properly insulated. The results of his experiments with this instrument were the following:—In very dry weather the wire readily attracted light bodies, if brought within three or four lines of it; and, if the weather was not stormy, the electricity of the air was about half as great as that of a stick of sealing-wax two inches long. When he grasped the wire in his hand, the signs of electricity disappeared entirely, and did not return till after an interval of three or four minutes. He also found that the electricity of the atmosphere was not increased with storms and hurricanes unattended with rain; for during a violent storm of wind, which continued uninterruptedly for three days, in the month of July, he found it necessary to place the dust within four or five lines of the conductor, before it exhibited a sensible attraction. No change was produced by the different directions of the winds. In the driest nights of summer he never could observe any electricity in the air, but it began to appear in the morning at sunrise, and vanished in the evening at about half an hour after sun-set. In the month of July, in a very dry day, when the sky was serene, and the heat intense, he found the electricity stronger than he had ever observed it. The dust was then attracted at the distance of ten or twelve lines from the conductor.

336. Mr. Kinnersley made several observations on the electricity of the atmosphere in its ordinary state, and informs us that when the air was very dry, he found it always contained some electricity, and that he rendered this electricity visible by electrifying himself negatively, and holding in his hand a long sharp needle, which, in the dark, appeared luminous at the point.

337. Beccaria, who was particularly attentive to this subject, and made numerous experiments both with rods and kites, found that, during the three following states of the atmosphere, it afforded no sensible indications of electricity. (1.) When the weather was clear, but at the same time windy. (2.) When the sky was covered with well defined black clouds, moving slowly. (3.) During moist weather, when not actually raining. The electricity was always perceptible when the sky was clear and the weather calm; in rainy weather, and when it did not lighten, the electricity appeared always a little before the rain fell, continued during the falling of the rain, and disappeared shortly after the rain ceased. The higher he raised his rods, the stronger he found these electrical signs.

338. M. de Saussure, however, has furnished us with the most extensive course of experiments on atmospherical electricity. He informs us that it is constantly varying, according to situation. It is generally strongest in elevated and insulated situations, not to be observed under trees, in streets, in houses, or any enclosed places, though it is sometimes to be found pretty strong on quays and bridges. It is also not so much affected by the absolute height of the places as their situation; thus a projecting angle of a high hill will often exhibit a stronger electricity than the plain at the top of the hill, as there are fewer points than in the former to deprive the air of its electricity. This variation in the intensity of the electricity of the atmosphere, seems influenced by numerous circumstances, some of which it is difficult satisfactorily to account for.

339. When the weather is not serene, it is impossible to assign any rule for their variation, as no regular correspondence can then be perceived with the different hours of the day, nor with the various modifications of the air. The reason is evident; when contrary and variable winds reign at different heights, when clouds are rolling over clouds, these winds and clouds, which we cannot perceive by any exterior sign, do, nevertheless, influence the strata of air in which we make our experiments, and produce these changes of which we only see the result, without being able to assign either the cause or its relation. Thus, in stormy weather, we find the electricity strong, then completely gone, and in a moment after rise to its former force; one instant positive, the next negative, without being able to assign any reason for these changes.

340. M. Saussure says, that he had known these changes succeed with such rapidity, that he had not time to note them down. When rain falls without a storm these changes are not so sudden; they are, however, very irregular, particularly with respect to intensity of force; the quality of them, too, is more constant. Rain or snow almost uniformly gives positive electricity. In cloudy weather, without rain or storms, the electricity follows generally the same laws as in serene weather. Strong winds generally diminish its intensity; they seem to mingle together the different strata of the atmosphere, and make them pass successively towards the ground, and thus distribute the electricity uniformly between the earth and the air. M. Saussure has observed a strong electricity with a strong north wind. The state of the air in which the electricity is strongest is foggy weather; this is also accompanied with electricity, except when the fog is going to resolve into rain.

341. The most interesting observations, and those which throw the greatest light upon the various modifications of electricity in our atmosphere, are those made in serene weather. In winter, and in serene weather, the electricity is generally weakest in the evening, when the dew has fallen, until sun-rising; its intensity afterwards augments by degrees, sometimes sooner and sometimes later; but generally before noon, it attains a certain maximum, whence it again declines, till the fall of the dew, when it will be sometimes stronger than it had been during the whole day; after which, it will again gradually diminish during the whole night; but, it is never quite destroyed, if the weather is perfectly serene. Atmospherical electricity seems, therefore, like the sea, to be subject to a flux and reflux, which causes it to increase and diminish twice in twenty-four hours. The times of its greatest force are some hours after the rising and setting of the sun: those when it is weakest precede these periods.

342. M. Saussure has given an instance of this periodic flux in electricity. On the 22nd of Feb. 1785, one of the coldest days ever remembered at Geneva, the hygrometer and thermometer were suspended in the open air on a terrace exposed to the south-west; the electrometer, from its situation, indicated an electricity equal to what it would have shown if it had been placed on an open plain. The height of the barometer was reduced to what it would have been if the mercury had been constantly at the temperature of 10° of Reaumur's thermometer. The place of observation was elevated sixty feet above the level of the lake. The observations of the day preceding and following this great cold were registered by him. There was a weak south-west wind during the whole three days; and it is rather remarkable, that most of the great colds, which have been observed at Geneva, were preceded by, or at least accompanied with, a little south-west breeze. From the first eighteen observations made during these three days, when the sky was quite serene, we learn that the electricity was pretty strong at nine o'clock A. M.; that from thence it gradually diminished till towards six o'clock P. M., which was its first minimum; after which it increased till eight o'clock, its second maximum; from whence it gradually declined till six the next morning, which was the time of its second minimum; after which, it again increased till ten in the morning, which was the first maximum of the following day; as this was cloudy, the periods were not so regular.

343. As we have hitherto but slightly noticed the method of exploring the atmosphere by the electrical kite, we shall here introduce an account of an experiment of this kind made by Mr. Cavallo, which is, in every respect, most gratifying and satisfactory; at least, it will be viewed in this light by every real lover of the science of electricity; and will, at the same time, read him a most useful lesson on the caution to be observed in making this boldest of all electrical experiments. It must be observed, that this experiment was made when there was no thunder; and that there had been none for three days before, nor did there happen to be any for three days after at the place where the scene occurred.

344. 'After,' says Mr. Cavallo, 'having rained a great deal in the morning and night before, the weather became a little clear in the afternoon, the clouds appearing separated, and pretty well defined. The wind was west, and rather strong, and the atmosphere in a temperate degree of heat. In these circumstances, at 3 P. M., I raised my electrical kite with 360 feet of string. After that the end of the string had been insulated, and a leather ball, covered with tin-foil, had been hung to it, I tried the power and quality of the electricity, which appeared to be positive and pretty strong.

345. 'In a short time, a small cloud passing over, the electricity increased a little; but the cloud being gone, it decreased again to its former degree. The string of the kite was now fastened by the silk lace to a post in the yard of the house in which I lived, which was situated near Islington, and I was repeatedly charging two coated phials, and giving shocks with them. While I was so doing, the electricity, which was still positive, began to decrease, and in two or three minutes' time it became so weak, that it could be hardly perceived with a very sensible cork-ball electrometer. Observing at the same time that a large and black cloud was approaching the zenith (which, no doubt, caused the decrease of the electricity), indicating imminent rain, I introduced the end of the string through a window, in a first-floor room, in which I fastened it by the silk lace to an old chair. The quadrant electrometer was set upon the same window, and was, by means of a wire, connected with the string of the kite.

346. 'It being now three-quarters of an hour after three o'clock, the electricity was absolutely unperceivable; however, in about three minutes time, it became again perceivable, but now upon trial was found to be negative; it is therefore plain, that its stopping was nothing more than a change from positive to negative, which was evidently occasioned by the approach of the cloud, part of which by this time had reached the zenith of the kite, and the rain also had begun to fall in large drops. The cloud came farther on, the rain increased, and, the electricity keeping pace with it, the electrometer soon arrived to 15°. Seeing now that the electricity was pretty strong, I began again to charge the two coated phials, and to give shocks with them; but the phials had not been charged above three or four times, before I perceived that the index of the electrometer was arrived at 35°, and was keeping still increasing. The shocks now being very smart, I desisted from charging the phials any longer; and, considering the rapid advance of the electricity, thought to take off the insulation of the string, in case that if it should increase farther it might be silently conducted to the earth, without causing any accident, by being accumulated in the insulated string.

347. To effect this, as I had no proper apparatus near me, I thought to remove the silk lace, and fasten the string itself to the chair; accordingly I disengaged the wire that connected the electrometer with the string, laid hold of the string, untied it from the silk lace, and fastened it to the chair; but while I effected this, which took up less than half a minute of time, I received about a dozen or fifteen very strong shocks, which I felt all along my arms, in my breast and legs, shaking me in such a manner, that I had hardly power enough to effect my purpose, and to warn the people in the room to keep their distance. As soon as I took my hands off the string, the electricity (in consequence of the chair being a bad conductor) began to snap between the string and the shutter of the window, which was the nearest body to it. The snappings, which were audible at a good distance out of the room, seemed first isochronous with the shocks which I had received, but in about a minute's time oftener; so that the people of the house compared their sound to the rattling noise of a jack going when the fly is off.

348. The cloud now was just over the kite; it was black, and well defined, of almost a cir-

cular form, its diameter appearing to be about 40°; the rain was copious, but not remarkably heavy. As the cloud was going off, the electrical snapping began to weaken, and in a short time became inaudible. I went then near the string, and finding the electricity weak, but still negative, I insulated it again, thinking to keep the kite up some time longer; but observing that another larger and denser cloud was approaching apace towards the zenith, as I had then no proper apparatus at hand, to prevent every possible accident, I resolved to pull the kite in; accordingly a gentleman who was by me began pulling it in, while I was winding up the string. The cloud was now very nearly over the kite, and the gentleman, who was pulling in the string, told me that he had received one or two slight shocks in his arms, and that if he were to feel one more, he would certainly let the string go; upon which I laid hold of the string, and pulled the kite in as fast as I could, without any farther observation, being then ten minutes after four o'clock.'

349. Mr. Cavallo, from the numerous experiments which he made with electrical kites, lays down the following results, which will be found correct in the generality of cases. (1.) 'The air appears to be electrified at all times; its electricity is constantly positive, and much stronger in frosty than in warm weather; but it is by no means less in the night than in the day-time. (2.) The presence of the clouds generally lessens the elasticity of the kite; sometimes it has no effect upon it; and it is very seldom that it increases it a little. To this the above-mentioned instance is a most remarkable exception. (3.) When it rains, the electricity of the kite is generally negative, and very seldom positive. (4.) The aurora borealis seems not to affect the electricity of the kite. (5.) The electric spark taken from the string of the kite, or from any insulated conductor connected with it, especially when it does not rain, is very seldom longer than a quarter of an inch; but it is exceedingly pungent. When the index of the electrometer is not higher than 20° the person who takes the spark will feel the effect of it in his legs; it appearing more like the dischage of an electric jar, than the spark taken from the prime conductor of an electrical machine. (6.) The electricity of the kite is generally stronger or weaker, according as the string is longer or shorter; but it does not keep any exact proportion to it. The electricity, for instance, brought down by a string of 100 yards, may raise the index of the electrometer to twenty, when, with double that length of string, the index of the electrometer will not go higher than twenty-five. (7.) When the weather is damp, and the electricity is pretty strong, the index of the electrometer, after taking a spark from the string, or presenting the knob of a coated phial to it, rises surprisingly quick to its usual place; but in dry and warm weather it rises very slowly. (8.) The principal use of the electrical kite is to show the electricity of the atmosphere; and it is perhaps the only instrument that will do this at all times with certainty, though several others have been invented for that purpose. But another use to which electrical kites have been applied, is to bring down quantities of the electric fluid from the upper regions of the atmosphere, for the purpose of supplying that deficiency of electricity, which is supposed to be hurtful to vegetation.'

350. From numerous experiments on the spontaneous electricity of the atmosphere made by Mr. Read, he has drawn the following conclusions:—(1.) 'That in moderate weather it is uniformly positive, and experiences an increase and a decrease in the degree of its intensity twice in twenty-four hours. (2.) That the electricity is strongest about two or three hours after sun-rise, and some time both before and after sun-set; and is in general in the weakest state between noon and four o'clock. (3.) And that this periodical electricity is obviously influenced by heat and cold.'

351. The latest experiments that have been made on this subject, on a large scale, are those by Andrew Crosse, Esq. of Broomfield, near Taunton. They were made by means of an apparatus the most extensive ever constructed. It consisted of a copper wire, one-sixteenth of an inch in thickness, stretched and insulated between two strong upright poles measuring from 100 to 110 feet in height.

352. No pains was spared to render this apparatus the most extensive and perfect that has been constructed. The insulated wire was one mile and a quarter in length, but having been exposed to various depredations, and liable to injury from other causes, it was shortened to 1800 feet. Every contrivance was tried to insulate this wire, but Mr. Crosse could not succeed in preserving the insulation during a dense fog, or a driving snow. A contrivance was adopted to lower the insulators, for the purpose of freeing them from spiders' webs; and it was necessary to fix the wire very securely, in order that it might be able to resist the weight of the great numbers of swallows that often perched upon it, and of wood-pigeons and owls that flew against it with considerable force. This apparatus has been in use for some years, and has enabled Mr. Crosse to draw the following conclusions, which confirm the observations of preceding authors.

353. (1.) 'The electricity is invariably positive during the usual state of the atmosphere, and subject to a regular increase and decrease, as stated in some of the preceding observations.

354. (2.) 'Fogs, rain, snow, hail, and sleet, produce changes in the electrical state of the wire. The electricity is negative when they first appear. It frequently changes to positive, increasing gradually in strength; and then decreasing in a similar manner, and changing from positive to negative every three or four minutes. Those phenomena have been so constantly observed, that, whenever the wire appears negatively electrified, it is considered as a certain indication, that either rain, snow, hail, mist, or a thunder-cloud, is approaching.

355. (3.) 'The approach of a charged cloud at first is sometimes found to produce positive, and sometimes negative electricity; but, whatever be the kind of the electricity which first appears, its intensity increases to a certain degree, then diminishes, and finally disappears, and is suc-

ceeded by the opposite electricity; which increases to a higher degree than the first had done; it then diminishes, and vanishes, and is again succeeded by the electricity which first appeared. These alternations of positive and negative electricity are often exceedingly numerous, and on different occasions succeed one another with different degrees of rapidity. The electricity, in general, becomes more intense at every repetition, till a copious and dense stream of sparks issues from the atmospherical conductor to the receiving-ball, stopping at intervals, and returning with redoubled force.

356. (4.) 'In this state of things, a strong current of air flows from the wire, and the apparatus with which it is connected. At every flash of lightning an explosive stream, attended by a very peculiar noise, passes between the balls and the apparatus, and brilliantly illuminates the surrounding objects, while the effects on the spectator are heightened by the successive peals of thunder, and the consciousness of being so near their cause.

357. 'When the electricity becomes too powerful to allow the observer to operate in safety, he connects the insulating wire with the ground; along this the whole passes off silently and harmlessly to the ground.

358. (5.) 'During a driving fog, or a smart rain, the wire is electrified almost as powerfully as during a thunder-storm, and the electricity exhibits similar changes.

359. (6.) 'A weak positive electricity generally prevails in cloudy weather. It often changes to negative when rain falls; but the positive electricity re-appears when the rain has ceased to fall.

360. (7.) 'The electricity is always stronger in clear frosty weather than during a fine summer's day.'

361. The following table, drawn up by Mr. Crosse, exhibits the intensity of the electrical appearances of the atmosphere in different states, commencing with those in which it is most powerful:—

(1.) During the occurrence of regular thunder clouds.

(2.) A driving fog, accompanied by small rain.

(3.) A fall of snow, or a brisk hail-storm.

(4.) A smart shower, especially in a hot day.

(5.) Hot weather succeeding a series of wet days.

(6.) Wet weather following a series of dry days.

(7.) Clear frosty weather, either in the night or day.

(8.) Clear warm summer weather.

(9.) A sky obscured by clouds.

(10.) A mackerel back, or mottled sky.

(11.) Sultry weather, the sky covered with light hazy clouds.

(12.) A cold damp night.

362. For common purposes, and occasional observations, Mr. Singer says, very simple contrivances may be employed. A common jointed fishing-rod, having a glass stick covered with sealing-wax substituted for the smallest joint, may be occasionally projected from the upper window of a house. A pair of pith-balls must be attached to a cork, in which the end of the glass stick is thrust; and this part of the apparatus is to be occasionally uninsulated, by placing a pin in the cork, connected with a thin wire held in the hand. In this uninsulated state, the fishing-rod and its attached electrometer are to be held for a few seconds projecting from the window, and, whilst in this position, the pin is to be withdrawn by pulling the thin wire; this insulates the electrometer, which may be then drawn in and examined. Its electricity will be found to be contrary to that of the atmosphere.

363. The last circumstance which we shall notice respecting the electricity of the atmosphere, is its effects on the vegetable kingdom. Much has been said relative to the merits of the question, whether the electricity of the atmosphere has or has not an influence on the process of vegetation. It is remarkable that this should ever for one moment have been matter of doubt with any one, since it is well known that light and heat, and, in one word, the free access of the air of our atmosphere, are all essential to the general process of vegetation. Where difficulties have occurred in the course of experiment on the subject, we are firmly persuaded that they relate entirely to the management of the apparatus employed; we can readily manage the regulations of warming, watering, and airing a small house, in which we wish to accelerate the growth of vegetable substances; but when we attempt to take, as it were, the management of the atmosphere in our own hands, and to regulate the general process of vegetation in our fields or gardens, we must expect to meet that disappointment which is ever attendant on quitting the sphere of action allotted to mortals. No series of experiments, how nicely soever conducted, can ever be expected to equal the silent, the invisible, but unerring operations of nature.

364. The first electrician who seems to have attended to this subject was Mr. Maimbray of Edinburgh, who, in the year 1746, electrified two myrtles, during the whole month of October, for some hours every day. The consequence was, that, in the following summer, these electrified myrtles put forth buds and blossoms sooner than those which had been left to nature.

365. Mr. Maimbray was followed by the abbé Nollet, who made some comparative experiments on the germination of seeds under similar circumstances, except that one plot was electrified three or four hours every day during the space of fifteen days. His experiments were attended with results similar to those obtained by Mr. Maimbray.

366. Experiments of a similar nature were repeated by others, and, as was to be expected, were in general followed by the like results. Hence the effect of electricity in promoting vegetation became universally acknowledged, till a series of well-conducted experiments, made by Dr. Ingenhousz, staggered the faith of philosophers in general on the subject

367. Several electricians, however, labored hard to support the credit of the abbé Nollet's system, although but with little success. Among these, the chief was the abbé Bertholon, who wrote a work which was entirely confined to the subject. The reasoning of this author, however incorrect it may appear to many, has certainly

the recommendation of ingenuity; and, although he carried his notions relative to the effects of electrical influence much farther than most are desirous of doing, we cannot perceive why these circumstances should be considered, as they have been by some, as the ground of ridicule.

368. But that our readers may form their own judgment on this subject, we shall here introduce the abbé's own account of the instrument with which his experiments were chiefly made, and of his method of procedure.

369. M. Bertholon commences his account by observing that there is continually and universally diffused in the atmosphere, and particularly in the higher regions, a considerable quantity of the electric fluid. 'This principle,' says he, 'being granted; in order to remedy the deficiency of electric fluid, which is supposed hurtful to vegetation, we must erect on the spot which we want to fecundate the following new apparatus, which has had all possible success, and which I shall call by the name of the electro-vegetometer. This machine is as simple in its construction as efficacious in its manner of acting; and I doubt not but it will be adopted by all those who are sufficiently instructed in the great principles of nature.'

370. The apparatus which the abbé here denominates his electro-vegetometer, consists of a mast or long pole firmly fixed into the ground to be able to resist the force of the wind; at the upper extremity of this pole is fixed a wire which terminates in one or more points, for the purpose of collecting the electricity of the air, and with which is connected a long insulated conductor, terminating in five or six points directed to the ground.

371. After having described at great length the construction of this apparatus, he proceeds to observe.—'The construction of this electro-vegetometer once well understood, it will be easy for us to conceive its effects. The electricity which prevails in the aërial regions will soon be drawn down by the elevated points of the upper extremity. This effect of the points is proved by the most decisive experiments, and is called by philosophers the power of the points.

372. 'By means of the electro-vegetometer just now described, one may be able to accumulate at pleasure this wonderful fluid, however diffused in the regions above, and conduct it to the surface of the earth, in those seasons when it is either scantily supplied, or its quantity is insufficient for vegetation, or, although it may be in some degree sufficient, yet it can never produce the effects of a multiplied and highly increased vegetation. So that by these means we shall have an excellent vegetable manure or nourishment, brought down as it were, from heaven, and that, too, at an easy expense; for, after the construction of this instrument, it will cost nothing to maintain it: it will be, moreover, the most efficacious you can employ; no other substance being so active, penetrating, or conducive to the germination, growth, multiplication, or reproduction, of vegetables. This heavenly manure is that which nature employs over the whole habitable earth, not excepting even those regions which are esteemed barren, but which, however, are often fecundated by those agents which nature knows so well to employ to the most useful purposes. Perhaps there was nothing wanting to bring to a completion the useful discoveries that have been made in electricity, but to show this so advantageous an art of employing electricity as a manure.

373. 'Consequently, that all the effects which we have already mentioned depend upon electricity alone; and, lastly, that all these effects, viz. acceleration in the germination, the growth, and production of leaves, flowers, fruit, and their multiplication, &c., will be produced even at a time when secondary causes are against it; and all this is brought about by the electric fluid, which we have the art of accumulating over certain portions of the earth, where we want to raise those plants that are most calculated for our use.

374. 'By multiplying these instruments, which are provided at little expense (since iron rods, of the thickness of one's finger, and even less, are sufficient for the purpose), we multiply their beneficial effects, and extend their use ad infinitum.

375. 'This apparatus having been raised with care in the midst of a garden, the happiest effects were perceived, viz. different plants, herbs, and fruits, in greater forwardness than usual, more multiplied, and of better quality. These facts are analogous to an observation which I have often made, viz. that plants grow fast, and are most vigorous, near thunder-rods, where their situation favors their development. They likewise serve to explain why vegetation is so vigorous in lofty forests, and where the trees raise their heads far from the surface of the earth, so that they seek, as it were, the electric fluid at a far greater height than plants less elevated; while the sharp extremities of their leaves, boughs, and branches, serve as so many points granted them by the munificent hand of nature, to draw down from the atmosphere that electric fluid which is so powerful an agent in forwarding vegetation, and in promoting the different functions of plants.'

376. It may be proper here to add, that others who succeeded Bertholon in his experiments, and with all his experience at their service, do not seem to have thrown any light on the subject. M. Achard, of Berlin, tried the effects of electricity on a small quantity of fermented rye, which was intended for distillation. He electrified one-half of it; and after five hours the vinous fermentation had ceased in the electrified portion, while in that which was not so treated it did not cease till after the lapse of eight hours. He then tried the effect of strong sparks upon a quantity of rye; which, excepting in one case, which he notices, he found to accelerate the process of fermentation.

### Miscellaneous Experiments, &c.

377. *Illuminated phosphorus*, or the Bolognian stone. Among the numerous methods devised for exhibiting the effects of electrical light, perhaps the most curious is that made with the real, or more easily with the artificial Bolognian stone, or Canton's phosphorus. This phosphorus

is a calcareous substance, generally used in the form of a powder, which has the property of absorbing light when exposed to it, and afterwards appearing lucid when brought into the dark. Take some of this powder, and, by means of spirits of wine or ether, stick it all over the inside of a clear glass phial, and stop it with a glass stopper, or a cork and sealing-wax. If kept in a room perfectly darkened, it will give no light; but let two or three sparks be drawn from the prime conductor, when the phial is kept at about two inches from the sparks, so that it may be exposed to that light, and this phial will receive that light, and afterwards will appear illuminated for a considerable time. The powder may be stuck upon a board by the white of an egg, so as to represent figures of planets, letters, or any thing else; and these may be illuminated in the dark, in the same manner as the phial. A beautiful method to express geometrical figures with the above phosphorus, is to bend small glass tubes of about the tenth part of an inch diameter, in the shape and figure desired, and then fill them with the phosphoric powder. These may be illuminated in the manner described, and they are not so subject to be spoiled as the figures represented upon the board frequently are. The best method of illuminating this phosphorus, and which Mr. W. Canton generally used, is to discharge a small electric jar near it.

378. *The tourmalin.*—The tourmalin, or the *lapis electricus* of Linnæus, is a hard semi-pellucid fossil, and was first observed to exhibit electrical phenomena, on being heated and cooled. This stone is found in abundance in the East Indies, and is named the electrical stone from its possessing many singular electrical properties. The properties of this stone seem to have been known to the ancients: Theophrastus mentions a stone which he terms the *lyncurium*, and describes it as being very hard; susceptible of a high polish, very useful for making seals, &c.; and possessing the property of attracting light substances. Hence there can be little doubt as to its being the tourmalin of the moderns. The Dutch seem to have discovered the properties of the tourmalin by observing that when placed in the fire it attracted the ashes; hence they gave it the name of aschen-trikker.

379. But by increasing its heat it becomes electrical, and still more so by diminishing it. Its electricity appears, not over its whole surface, but only on two opposite sides, which have been styled its poles, as they are in a line with its centre, and in the same direction with its strata; in which direction it is opaque, though semi-transparent in the other.

380. During the process of heating, the tourmalin has one of its sides electrified positively, and the other negatively; but, while cooling, the former becomes negative and the latter positive. If heated and allowed to cool without either side being touched, the former will be positive and the latter negative, all the time it is heating or cooling. If excited by rubbing, each of its sides, or both at once may be rendered positive. I heated or cooled upon an insulated substance that substance will become possessed of the electricity contrary to that of the side of the tourmalin, which was laid on it. The electricity of both sides, or of either, may be reversed by heating or cooling the stone, in contact with other bodies.

381. If a tourmalin be cut in pieces, each piece will have its positive and negative poles, as well as the whole stone. All the above properties are observable in vacuo. If this stone be covered over with wax, oil, or any similar electric, it will exhibit the same electric signs as without the covering.

382. In making experiments with the tourmalin, Mr. Canton observed a vivid light upon it, while heating in the dark, by which he could determine which end of the tourmalin was positive or negative. When excited, it emits very strong flashes in the dark, from the positive to the negative end. Mr. Canton has also observed the Brasilian emerald emit light while heating in the dark. Mr. Cavallo 'imagines that every other precious stone will show it if its electric power be sufficiently strong; since the light is a consequence of the passage of a sufficient quantity of electricity through the air, or other partly resisting medium.'

383. The electrical power of the tourmalin is sometimes improved, sometimes injured, sometimes not in the least affected by a strong fire. Most of the above properties, which were supposed to be peculiar to the tourmalin, are possessed by several hard precious stones, which are capable of becoming electrical by heating and cooling, and have their positive and negative sides lying in the direction of their strata, &c.

384. *Evaporation produces electricity.*—This appears to have been a discovery of Signor Volta, who observed that the evaporation of water and some other fluids, as well as certain effervescences, generated electricity. His experiments seem to prove that fluids, or other bodies, reduced to vapor, become electrified positively, and leave the bodies from which they evaporated, electrified negatively; and that on the other hand, when the vapors are condensed into a fluid, they become electrified negatively, and leave the bodies with which they were last in contact electrified positively.

385. The common method of illustrating this is the following:—Place on the cap of a gold-leaf electrometer a metallic dish containing a few lighted coals, and project on them a few drops of water, whilst an insulated funnel is held about a foot or eighteen inches above. Under these circumstances the electrometer is found to be negatively electrified, and the insulated funnel positively. On this experiment Mr. Walker observes, that the vapor carries off the latent electricity from the electrometer; the leaves diverge, and fly to the slips of tin-foil to supply their loss. He adds, perhaps the vapor derives its volatility from its union with electricity, for it is observable, that if insulated pith-balls be suspended in a fog or mist, they separate spontaneously with positive electricity.

386. *To electrify the air of a room.*—This is an experiment which may be easily performed with a powerful machine. The room ought to be very clean, and as free as possible from

pointed metallic substances. These things being observed, place a few pointed wires in the prime conductor of the machine; put the machine in action, and after the lapse of a few minutes the air of the room will become so impregnated with electricity as to be very perceptible to the sense of smelling, and will readily affect a delicate electrometer, particularly if brought into the vicinity of the machine. The odor perceived on this occasion very much resembles that of oxygen gas, or of the atmospheric air in a very clear and frosty night.

387. *The charge of a jar is retained in the electric.*—This is proved in a very satisfactory manner by the following experiments, which show that the coating of the Leyden jar has not quite so much to do with the charge as is generally supposed. The first is given by Mr. Walker in his System of Familiar Philosophy, and is in substance as follows:—Lay a plate of tin or brass on your hand, and on it a plate of glass (rather larger than the metallic plate); on the glass lay another metallic plate, and let this communicate with the prime conductor: thus the glass may be charged. By the edge of the glass disengage it from the two plates, and place two other plates in the same situation, upon and under the glass. If now one knob of the discharging-rod be made to touch the under plate, and the other knob the upper plate, a discharge will ensue the same as if the first plates had remained in their place.

388. The same principle is thus illustrated by the Leyden jar; we give the process as directed by Mr. Singer:—Procure a jar with a double set of moveable tin-coatings, either of which may be adapted to it at pleasure; the outer coating being a tin can large enough to admit the jar easily within it; and the inner coating a similar can sufficiently small to pass readily in the inside of the jar. The charging wire of the inner coating should be surrounded by a glass tube covered with sealing-wax, to serve as an insulating handle, by which the inner coating may be lifted from the jar when that is charged, without communicating a shock to the operator. Arrange the jar with its coatings, and charge it; it will act in every respect as an ordinary coated jar. Charge the jar, and, without discharging it, remove the inner coating by its insulating handle; if this coating, when removed, be examined, it will be found not at all, or but slightly electrified: lift the jar carefully from within its outer coating, and examine that; it will evince no signs of electricity.

389. Let the jar be now fitted up with the other pair of moveable coatings; apply the discharger, and an explosion and spark will follow, which clearly proves that the accumulation is retained by the attractive power of the glass, and that the coatings are only useful as conductors to the charge.

390. *Velocity of the electric fluid.*—Although we have already made some passing remarks on this subject, the following detail will, we doubt not, be found interesting to the admirers of the electrical science. Several electricians of distinguished merit have made experiments on the velocity of the electric fluid; those to which we here particularly refer were made under the direction and superintendence of Mr. Watson, who, as an eye-witness of them, drew up the account to lay before the Royal Society.

391. The first attempt of these electricians was to convey electric shocks across the river Thames, availing themselves of the water of the river as one part of the circuit through which the charge was to pass. This they accomplished on the 14th and 18th of July, 1747, by fastening a wire all along Westminster-bridge, at a considerable height above the water. One end of this wire communicated with the coating of a charged phial, the other being held by an observer, who, in his other hand, held an iron rod, which he dipped into the river. On the opposite side of the river stood a gentleman, who likewise dipped an iron rod in the river with one hand; and in the other held a wire, the extremity of which might be brought into contact with the wire of the phial.

392. When the discharge was made, the shock was distinctly felt by the observers on both sides of the river, but more sensibly by those who were stationed on the same side with the machine; part of the electric fire having gone from the wire down the moist stones of the bridge thereby making several shorter circuits to the phial, but still all passing through the gentlemen who were stationed on the same side with the machine. This was, in a manner, demonstrated by some persons feeling a sensible shock in their arms and feet, who only happened to touch the wire at the time of one of the discharges, when they were standing upon the wet steps which led to the river. In one of the discharges made upon this occasion, spirits were kindled by the fire which had gone through the river. The gentlemen made use of wires in preference to chains, as communicating a stronger degree of electricity.

393. Their next attempt was to cause the electrical fluid to make a circuit of two miles, at the New River at Stoke Newington. This they performed on the 24th of July, 1747, at two places; at one of which the distance by land was 800 feet, and by water 2000: in the other, the distance by land was 2800 feet, and by water 8000. The disposition of the apparatus was similar to what they had before used at Westminster-bridge, and the effect answered their utmost expectations. But as, in both cases, the observers at both extremities of the chain, which terminated in the water, felt the shock as well when they stood with their rods fixed into the earth twenty feet from the water, as when they were put into the river; it occasioned a doubt, whether the electric circuit was formed through the windings of the river, or a much shorter way, by the ground of the meadow; for the experiment plainly showed that the meadow-ground, with the grass on it, conducted the electricity very well.

394. From subsequent experiments they were fully convinced that the electricity had not in this case been conveyed by the water of the river, which was two miles in length, but by land where the distance was only one mile; in which space, however, the electric matter must neces-

sarily have passed over the New River twice, and have gone through several gravel-pits, and a large stubble-field.

395. On the 28th of July, they repeated the experiment at the same place, with the following variation of circumstances:—The iron wire was, in its whole length, supported by dry sticks, and the observers stood upon original electrics; the effect was, that they felt the shock much more sensibly than when the conducting-wire had lain upon the ground, and when the observers had likewise stood upon the ground, as in the former experiment. Afterwards, every thing else remaining as before, the observers were directed, instead of dipping their rods into the water, to put them into the ground, each 150 feet from the water. They were both smartly struck, though they were distant from each other above 500 feet.

396. Their next object was to determine whether the electric virtue could be conveyed through dry ground; and, at the same time, to carry it through water to a greater distance than they had done before. For this purpose they pitched upon Highbury Barn, beyond Islington, where they carried it into execution on the 5th of August, 1747. They chose a station for their machine almost equally distant from two other stations, for observers upon the New River, which were somewhat more than a mile asunder by land, and two miles by water.

397. They had found the streets of London, when dry, to conduct very strongly for about forty yards; and the dry road at Newington about the same distance. The event of this trial answered their expectations. The electric fire made the circuit of the water, when both the wires and the observers were supported upon original electrics, and the rods dipped into the river. They also both felt the shock, when one of the observers was placed in a dry gravelly pit, about 300 yards nearer the machine than the former station, and 100 yards distant from the river: from which the gentlemen were satisfied, that the dry gravelly ground had conducted the electricity as strongly as water.

398. From the shocks which the observers received, when the electric power was conducted upon dry sticks, they were of opinion, that, from the difference of distance simply considered, the force of the shock, as far as they had yet experienced, was very little if at all impaired. When they stood upon electrics, and touched the water on the ground with the iron rods, the shock was always felt in their arms or wrists; when they stood upon the ground, with their iron rods, they felt the shock in their elbows, wrists, and ankles; and, when they stood upon the ground without rods, the shock was always felt in the elbow and wrist of that hand which held the conducting wire, and in both ankles.

399. The last investigation which these gentlemen made on this subject, and which required all their sagacity and address in the conduct of it, was to try whether the electric shock was perceptible at twice the distance to which they had before carried it, in ground perfectly dry, and where no water was near; and also to distinguish, if possible, the respective velocity of electricity and sound. For this purpose they fixed upon Shooter's Hill, and made their first experiments on the 14th of August, 1747; a time when, as it happened, but one shower of rain had fallen during five preceding weeks. The wire communicating with the iron rod which made the discharge, was 6732 feet in length, and was supported all the way upon baked sticks: as was also the wire which communicated with the coating of the phial which was 3868 feet long, and the observers were distant from each other two miles.

400. The result of the explosion demonstrated to the satisfaction of the gentlemen present, that the circuit performed by the electric matter was four miles, viz. two miles of wire and two of dry ground, the space between the extremities of the wires; a distance which, without trial, as they justly observed, was too great to be credited. A gun was discharged at the instant of the explosion and the observers had stop-watches in their hands, to note the moment when they felt the shock: but as far as they could distinguish, the time in which the electric matter performed that vast circuit might have been instantaneous. In all the explosions where the circuit was made of considerable length, it was observed that though the phial was very well charged, yet that the snap at the gun barrel, made by the explosion was not near so loud as when the circuit was formed in a room: so that a by-stander, says Dr. Watson, though versed in these operations, would not imagine from seeing the flash, and hearing the report that the stroke at the extremity of the conducting wire could have been considerable; the contrary whereof, when the wires were properly managed, he says, always happened.

401. Still, these philosophers were desirous to ascertain the absolute velocity of electricity at a certain distance; because though in the last experiment, the time of its progress was certainly very small, if any, they were desirous of knowing, small as that time might be, whether it was measurable: and Dr. Watson had contrived an excellent method for that purpose. Accordingly, on the 5th of August, 1748, the gentlemen met once more at Shooter's Hill; when it was agreed to make an electric circuit of two miles, by several turnings of the wire in the same field. The middle of this circuit they contrived to be in the same room with the machine, where an observer took in each hand one of the extremities of the wires, each of which was a mile in length. In this excellent disposition of the apparatus, in which the time between the explosion, and the shock might have been observed to the greatest exactness, the phial was discharged several times; but the observer always felt himself shocked at the very instant of making the explosion. Upon this the gentlemen were fully satisfied, that through the whole length of this wire, which was 12,276 feet, the velocity of the electric matter was instantaneous.

402. Notwithstanding all this surprising velocity, it is certain, that both sides of a charged phial may be touched so quickly, even by the best conductors, that all the electric matter had not time to make the circuit, and the phial will

remain but half discharged. If the upper plate of an electrophorus also is very suddenly touched with the finger, or any other conductor, a very small spark will be obtained on lifting it up; though a very strong one would be got if the finger was kept longer upon it. But how this seeming slowness can be reconciled with the immeasurable velocity above mentioned, does not appear. It is certain, indeed, that this fluid is considerably resisted in its passages through or over every substance. It will even prefer a short passage in the air where it is violently resisted to one along a wire of very great length; but here, as in every other case, it seems to divide its force, and to break through several different passages at once.

403. The amazing velocity of the electric fluid has recently given rise to some speculations on the subject of constructing electrical telegraphs; this idea, however, appears altogether chimerical, as has been proved by some experiments made by professor Barlow, of the Royal Military Academy. By employing wires of different lengths up to 840 feet, and measuring the energy of the electric action by the deflection produced in the magnetic needle, he found that the intensity rapidly diminishes, and very nearly as the inverse square of the distance. Mr. Barlow also ascertained that the effect was greater with a wire of a certain size than with a finer one; but at the same time, that no advantage was gained by increasing the diameter beyond a certain limit.

404. We have thus gone through what we consider as the essentials of electricity in general; we have omitted several things which we consider as being now obsolete, and some also that are of too trifling a nature to deserve a place in any work pretending to respectability. It has been our aim to produce the most useful information on every part of the subject, and to give the whole as much interest and life as the nature of a subject, purely philosophical, would admit. It may, however, be adviseable, prior to closing the present article, to furnish our readers with the latest facts in the science of electricity, and many that follow are discoveries that are due to the period that we are now writing.

### On Paratonnerres, or Conductors of Lightning.

405. A very interesting report on the subject of paratonnerres, has been presented to the Royal Academy of Sciences by M. Gay Lussac. The paper is divided into two parts; one theoretical, and the other practical, and the information contained in it may be regarded as the most perfect we possess on the subject.

406. The theoretical part is introduced with some general observations on electric matter, and of conductors; that its velocity is at the rate of about 1950 feet per second; that it penetrates bodies, and traverses their substance, with unequal degrees of velocity; that the resistance of a conductor increases with its length, and may exceed that which would be offered by a worse but shorter conductor; and that conductors of small diameter conduct worse than those of larger. The electric matter also tends always to spread itself over conductors, and to assume a state of equilibrium in them, and becomes divided among them in proportion to their form, and principally to their extent of surface; and that hence a body that is charged with the fluid being in communication with the immense surface of the earth, will retain no sensible portion of it.

407. Gay Lussac defines a paratonnerre to be a conductor which the electric matter prefers to the surrounding bodies, in order to reach the ground, and expand itself through it; and commonly consists of a bar of iron elevated on the buildings it is intended to protect, and descends without any divisions or breaks in its length, into water or moist ground. When a paratonnerre has any breaks in it, or is not in perfect communication with a moist soil, the lightning, having struck it, flies from it to some neighbouring body, or divides itself between the two, in order to pass more rapidly into the earth.

408. The most advantageous form that can be given to the extremity of a paratonnerre is that of a sharp cone, and the higher it is elevated in the air, other circumstances being equal, the more its efficacy will be increased, as is proved by the experiments of M.M. de Romas and Charles.

409. It has not been accurately ascertained how far the sphere of action of a paratonnerre extends; but, in several instances, the more remote parts of large buildings on which they have been erected, have been struck by lightning at the distance of three or four times the length of the conductor from the rod. According, however, to the opinion of Charles, a paratonnerre will effectually protect from lightning a circular space, whose radius is twice that of the height of the conductor. By increasing, therefore, the altitude of a conductor, the space also which it will protect is augmented in proportion.

410. A current of electric matter, whether luminous or not, is always accompanied by heat, the intensity of which depends on the velocity of the current. This heat is sufficient to make a metallic wire red hot, or to fuse or disperse it, if sufficiently thin; and hence we may perceive the absurdity of some attempts which have been lately made, to protect ships, by thin slips of copper nailed to the masts. The heat of the electric fluid scarcely raises the temperature of a bar of metal, on account of its large mass; and no instance has yet occurred of an iron bar, of rather more than half an inch square, or of a cylinder of the same diameter, having been fused, or even heated red hot by lightning. A rod of this size would, therefore, be sufficient for a paratonnerre; but, as its stem should rise from fifteen to thirty feet above the building, it would not be of sufficient strength at the base to resist the action of the wind, unless it were made much thicker at that part. An iron bar, about three-quarters of an inch. is sufficient for the conductor of the paratonnerre.

411. According to Gay Lussac, a paratonnerre consists of two parts, the stem which projects in the air above the roof, and the conductor,

which descends from the foot of the stem to the ground. The stem he proposes to be a square bar of iron, tapering from its base to the summit, in form of a pyramid, and for a height of from twenty to thirty feet, which is the mean length of the stems placed on large buildings; the base should be about two inches and a half square. Iron being very liable to rust by the action of air and moisture, the point of the stem would soon become blunt; and therefore, to prevent it, a portion of the top, about twenty inches in length, should be composed of a conical stem of brass or copper, gilt at its extremity, or terminated by a small platina needle, two inches long. Instead of the platina needle, one of standard silver may be substituted, composed of nine parts of silver, and one of copper. The platina needle should be soldered with a silver solder to the copper stem; and to prevent its separating from it, which might sometimes happen, notwithstanding the solder, it should be secured by a small collar of copper. The copper stem is united to the iron one, by means of a gudgeon, which screws into each; the gudgeon is first fixed in the copper stem by two steady pins at right angles to each other, and is then screwed into the iron stem, and secured there also by a steady pin.

412. The conductor should be about three-quarters of an inch square, and, as before stated, reach from the foot of the stem to the ground. It should be firmly united to the stem, by being tightly jammed between the two ears of a collar, by means of a bolt. The conductor should be supported parallel to the roof, at about six inches distance from it, by forked stanchions, and after turning over the cornice of the building, without touching it, should be brought down the wall, and to which it should be fastened by means of cramps. At the bottom of the wall, it is bent at right angles, and carried in that direction twelve or fifteen feet, when it turns down into a well.

413. Since iron buried in the ground in immediate contact with moist earth soon becomes covered with rust, and is by degrees destroyed, the conductor should be placed in a trough filled with charcoal, in the following manner. Having made a trench in the earth, about two feet deep, a row of bricks is laid on their broad faces, and on them others on edge; a stratum of bakers' ashes (braise de boulanger) is then strewed over the bottom bricks, about two inches thick, on which the conductor is laid, and the trough then filled up with more ashes, and closed by a row of bricks laid along the top. Iron thus buried in charcoal, will undergo no change in thirty years. After leaving the trough, the conductor passes through the side of the well before alluded to, and descends into the water to the depth of at least two feet below the lowest water line. The extremity of the conductor usually terminates in two or three branches, to give a readier passage to the lightning into the water. If there be no well at hand, a hole must be made in the ground, with a six-inch auger, to the depth of about ten or fifteen feet, and the conductor passed to the bottom of it, placing it carefully in the centre of the hole, which is then to be filled up with bakers' ashes, rammed down as hard as possible, all round the conductor. In a dry soil, or on a rock, the trench to receive the conductor should be at least twice as long as that for a common soil, and even longer, if thereby it be possible to reach moist ground. Should the situation not admit of the trench being much increased in length, others, in a transverse direction, should be made, in which small bars of iron, surrounded by ashes, are placed and connected with the conductor. In general, the trench should be made in the dampest, and consequently lowest spot near the building, and the water gutters made to discharge their waters over it, so as to keep it always moist. Too great precautions cannot be taken to give the lightning a ready passage to the ground, for it is chiefly on this that the efficacy of a paratonnerre depends.

414. As iron bars are difficult to bend according to the projections of a building, it has been proposed to substitute metallic ropes in their stead. Fifteen iron wires are twisted together, to form one strand, and four of these form a rope, about an inch in diameter. To prevent its rusting, each strand is well tarred, separately, and, after they are twisted together, the whole rope is tarred over again with great care. Copper or brass wire is, however, a better material for their construction than iron. If a building contain any large masses of metal, as sheets of copper or lead on the roof, metal pipes and gutters, iron braces, &c., they must all be connected with the paratonnerre, by iron bars of about half an inch square, or something less. Without this precaution, the lightning might strike from the conductor to the metal (especially if there should be any accidental break in the former), and occasion very serious injury to the building, and danger to its inhabitants.

415. *Paratonnerres for Churches.*—For a tower, the stem of the paratonnerre should rise from fifteen to twenty-four feet, according to its area; the domes and steeples of churches, being usually much higher than the surrounding objects, do not require so high a conductor as buildings with extensive flat roofs. For the former, therefore, their stems, rising from three to six feet above the cross or weather-cock, will be sufficient, and being light they may easily be fixed to them without injuring their appearance, or interfering with the motion of the vane.

416. *Paratonnerres for Powder-Magazines.*—These require to be constructed with the greatest care. They should not be placed on the buildings, but on poles at from six to ten feet distance. The stems should be about seven feet long, and the poles of such a height, that the stem may rise from fifteen to twenty feet above the top of the building. It is also advisable to have several paratonnerres round each magazine. If the magazine be in a tower, or other very lofty building, it may be sufficient to defend it by a double copper conductor, without any paratonnerre stem. As the influence of this conductor will not extend beyond the building, it cannot attract the lightning from a distance, and will yet protect the magazine, should it be struck.

417. *Paratonnerres for Ships.*—The stem of a paratonnerre for a ship, consists merely of a

copper point, screwed on a round iron rod, entering the extremity of the top-gallant mast. An iron bar, connected with the foot of the round rod, descends down the pole, and is terminated by a crook or ring, to which the conductor of the paratonnerre is attached, which, in this case, is formed of a metallic rope, connected at its lower extremity with a bar or plate of metal, and which latter is connected to the copper sheathing on the bottom of the vessel. Small vessels require only one paratonnerre; large ships should have one on the main-mast and another on the mizen-mast.

418. The late ingenious Mr. George Singer, in his excellent work on electricity, proposed to have conductors fixed to the surfaces of masts, and the electric fluid conveyed by means of strips of metal, over the deck and the sides of the vessel; but this arrangement on many accounts is highly objectionable, and the mode proposed by Gay Lussac, or perhaps that commonly adopted in the British navy, of conveying the electric fluid from the mast-head to the surface of the water, in a direct line, by means of a series of long copper links, is the best which has hitherto been devised.

419. It is allowed from experiment, that the stem of a paratonnerre effectually defends a circle of which it is the centre, and whose radius is twice its own height. According to this rule, a building sixty-feet square, requires only a stem of fifteen or eighteen feet raised in the centre of the roof. A building of 120 feet, by the same rule, would require a stem of thirty feet, and such are sometimes used; but it is better, instead of one stem of that length, to erect two of fifteen or eighteen feet, one placed at thirty feet from one end of the building, the other at the same distance from the other end, and consequently sixty feet from each other. The same rule should be followed for three or any greater number of paratonnerres. A plate is given in the Annals of Philosophy to illustrate this interesting subject more particularly.

### Electro-motive Action of Water on Metals.

420. M. Becquerel has endeavoured to ascertain experimentally the electrical effects produced by the contact of water and metals. The effect is so small as to be easily mistaken for, or confounded with, those due to electricity produced accidentally during the performance of the experiments, by contact of various parts of the apparatus, or in other ways: but taking every possible precaution, and testing his results in all ways, he arrived at the conclusion that zinc, iron, lead, tin, copper, &c., communicated positive electricity to water; whilst platina, gold, silver, &c., gave it negative electricity. Water is therefore positive with the metals which are most positive, and negative with those which are least positive. It operates, therefore, upon oxidable metals as alkalies do in their conduct with acids, when there is no chemical action. The same phenomena take place even when a little sulphuric acid is present, and the iron and zinc are acted upon, so that chemical action in this case did not prevent the production of electricity by the contact of metals and water

421. By certain changes of the surface, it was found that the intensity of electricity produced was much affected. A plate of gold, plunged in nitric acid for a few moments, and then washed in several fresh portions of water, produced a development of electricity much greater than before, the water still becoming negative. The same plate, plunged into a solution of potassa and then washed, lost in a great measure its power of becoming electrified by contact with water. A plate of platinum offered similar results. It is supposed, that these effects may have a distant analogy with the facts observed by M. M. Thenard and Dulong, that a new platina wire, which would not heat in a current of hydrogen gas and air, acquired this property by being previously plunged for a few minutes in nitric acid, and then washed. The property of the wire continued for above twenty-four hours; and M. Becquerel says, that the plate of gold preserved its power of becoming strongly electrified in contact with water, for several hours.

### On the Electrical Actions produced by the Contact of Flames and Metals.

422. In place of making a complete metallic circuit, as in Seebeck's experiment; or one in which the circuit was by water or acid, as in the Voltaic pile; the metals used were connected by a flame only, and their states ascertained by the electrometer. The flames used were those resulting from the combustion of alcohol, hydrogen gas, or a sheet of paper. When a plate of platina was placed on the cap of the electrometer, and heated by one of the flames before mentioned, if the temperature was a red heat or above, the metal became negative, but below a red heat it became positive. On trying the electricity of the flame, by making it rise from a piece of wet wood on the cap of the instrument, and holding the platina in it, the reverse, as expected, was found to be the case.

423. A copper wire gave the same results, and generally it appeared that all the metals had the property just described; thus any metal, plunged into a flame of hydrogen gas, becomes negative or positive according as the temperature is higher or lower, and communicates the contrary electricity to the flame.

424. If the flame by which the plate of metal on the cap of the instrument is heated, be touched by a piece of wet wood instead of being insulated, the effects are more distinct: but if, instead of touching it with wet wood, it be touched with a plate of the same metal as that on the electrometer, the two portions of metal are found in different states: that heated to redness being negative, and the one heated to a less degree positive. The same effects are obtained if the two plates be of different metals. They are also produced if the flame urged by a blow-pipe be used.

425. These phenomena may be supposed to result either from the friction of the flame on the metals, or from an electro-motive action. M. Becquerel inclines to the latter opinion, conceiving it improbable that the tranquil flame of alcohol can produce friction sufficient to suffice for the

effect; and not being able to account by friction for the circumstance of two pieces of metal acquiring different electricities in the same flame, according to the temperature. That the effect was not due to the difference of temperature existing in various parts of the same piece of metal, was proved by the entire absence of any electrical phenomena, when a plate of platinum was heated to redness in the focus of M. Fresnel's strong burning-glass. These experiments have some relation to that of M. Volta on the combustion of a piece of amadou at the extremity of a rod communicating with the condensing plate of an electrometer. M. Volta found, that when the apparatus was distant from habitations, the amadou became positive by taking electricity from the circumambient air, from which he concluded that the atmosphere had always an excess of positive electricity.

### Electrical Phenomena accompanying Combustion.

426. M. Becquerel found, that on rolling up a sheet of paper, placing it in the electrometer, inflaming it, and touching the flame with a piece of wet wood that the electricity might flow away more rapidly, the paper became positively electrical. If the experiment were inverted, the paper being held in the hand, and the flame made to touch the piece of wet wood placed on the electrometer, it was found that the flame took negative electricity. Hence it may be concluded, that when paper is burnt, the paper becomes positive, and the flame negative.

427. If alcohol be burnt in a copper capsule, it is found by the condenser that the capsule becomes electrified positively.

### On the Electro-motive Force of certain Substances.

428. *Carburet of iron.*—In electro-motive power it yields only to certain oxides of manganese. It is augmented by immersion into acidulated water, if the plate be not wiped when withdrawn. This increase of power is not dissipated spontaneously, but is easily lost by the action of an inferior metal, as zinc. When the latter action diminishes that belonging to the carburet, it is resumed spontaneously in a few minutes. The Passau crucibles contain much plumbago, and possess the same properties if the clay has not been too much vitrified; a crucible having an internal surface of 100 square inches, and a vessel of similar form made of thin lead, produced a very useful apparatus.. A small interval was left between the leaden vessel and the crucible, and the interval filled with a strong acid solution. By heating the crucible, and cooling the interior of the leaden vessel, important effects, dependent upon the difference of temperature, could be observed.

429. *Mercury.*—This metal ranges between sulphuret of lead and silver; when impure it becomes inferior even to brass, but distillation restores it to its place.

430. *Iron.*—Its electro-motive power is changed by oxidation, but not much. Its place is always between tin and brass.

431. *Tin* is superior to lead, but the least degree of oxidation renders it inferior. *Lead,* with zinc, gives greater deviations than tin, iron, brass, or copper. There is no arrangement formed with substances so near to each other, which produces so energetic a current, and it is in this respect opposed to that presented by zinc, with gold or platina.

432. *Charcoal,* heated until it ceases to yield flame and slowly cooled, is equal to the metals in electro-motive and conducting power. It does not retard the feeblest electric current. Its electro-motive power is variable, according to the manner in which it is cooled, and also to its exposure to air.

433. *Oxide of tin,* crystallised, produces currents, with all the metals inferior to it, as zinc, lead, tin, &c.; but none when in communication with bodies having a superior electro-motive force, as gold, silver, carburet of iron, gray manganese, &c.—*Annales de Chimie,* XXXIII., 136.

434. List of good conductors, arranged in the order of their electro-motive power, the most powerful being first.

Charcoal after long exposure to air.
Gray radiated manganese.
Oxide of manganese.
Uncrystallised iron pyrites.
Magnetic iron pyrites.
Crystallised arsenical pyrites
Carburet of iron.
Cubic iron pyrites.
Auriferous tellurium.
Gold.
Platina.
Copper pyrites.
Lamelliform tellurium.
Gray cobalt.
Gray copper ore.
Arsenical nickel.
Charcoal slowly cooled.
Sulphureted protoxide of iron.
Sulphuret of lead.
Red silver ore (bright).
Arsenical silver, and arsenic slightly oxidised.
Mercury.
Silver.
Tarnished antimony.
Arsenic.
Sulphuret of molybdena.
Crystallised oxide of tin.
Tarnished copper.
Antimony (bright).
Charcoal extinguished in water.
Nickel.
Tarnished bismuth.
Brass much oxidised.
Bright copper.
Brass.
Crystallised protoxide of iron.
Iron.
Tarnished lead.
Manganese.
Tin.
Bright lead.
Charcoal, instantly after extinction in water.
Zinc.

### Insulation of Electricity.

435. M. Haüy, in his method of distinguishing precious stones, &c., joins the electric indications given by a gem when rubbed or pressed to its other physical characters. That these indications may be obtained more readily, M. Haüy has invented two small instruments, very portable, and ready to furnish the two kinds of electricity. One of them is a small bar of Iceland spar, fixed to the end of a needle or lever, which is then suspended by the middle so as to be balanced by a thread of silk. When the spar is pressed between the fingers, it becomes positively electric, and then the electricity of another body, however excited, as of a gem by friction, is ascertained by its attraction or repulsion of the spar. The second instrument is formed of a piece of sealing-wax, flattened at one end so that it may stand on a table, and at the other supporting the point of a needle; a needle of silver or copper, terminated at the extremities by beads, moves on this as on a centre. To charge this apparatus, a piece of amber or sealing-wax is to be excited negatively by friction, and then by touching the needle it becomes similarly electrified, and is then ready to indicate by attraction or repulsion the kind of electricity possessed by another body.

436. M. Haüy has also noticed the extreme permanency of the electrical states of these two apparatuses. His attention was drawn to this circumstance, from the perfection of their action during extremely moist weather, and he was induced to make a few experiments on the subject. The permanency of the electricity excited on the spar depends on the difficulty of adhesion between it and water. In damp weather no moisture deposits on it, so that electricity given to it is perfectly retained. Even if it be dipped in water, and afterwards pressed without wiping, it becomes strongly electric, because no water adheres to its surface to conduct the power away; and M. Haüy at last ascertained that immersion in water was not sufficient to remove electricity previously communicated to it. The permanency, therefore, of its electrical state in the atmosphere, and the value of this property may easily be conceived. If the water be rubbed on the surface of the crystal so as actually to wet it, then no electricity is generated by pressure, and what may have previously been generated is of course dissipated.

437. M. Haüy has observed also, that fluate of lime and the euclax also acquired electricity by pressure, though not so powerfully as Iceland spar; and he found them also to possess similar relations to water.

438. During his experiments on the electricity of minerals, M. Haüy found that the second apparatus also had the power of preserving its electric state unimpaired for a long time; a circumstance scarcely to be expected from its construction. In examining the apparatus, this power was found to depend on the sealing-wax foot, for if that were removed and the needle hung by silk, though it readily took electricity from other bodies, yet it also soon lost it; whereas, on its pivot and foot of sealing-wax, it retained it in damp weather for hours. This appears to depend on a portion of electricity, which, when the needle is first charged, passes on to the surface of the sealing-wax, and, remaining there for a while, gradually returns to the needle, as its state is reduced by the action of the moist air, and supports, as it were, its electricity at a higher tension than it otherwise would have. M. Haüy expresses this by saying that the sealing-wax has the power both of conducting and insulating; by the first it receives a part of the electricity given to the needle, by the second it retains it, and then by the first it gives it back again to the needle when the air has taken away its own portion. The evident conclusion from the experiments is, that the apparatus is always ready for use, and will act in any weather.

### Plate Electrical Machines.

439. A variation in the construction of plate electrical machines has been devised and practiced by M. Metzger, of Siblingen, in Schaffhouse, which seems to be a real improvement. Considering that the effect desired in using the machine was first highly to excite the glass, and then to collect the electricity from it, M. Metzger concluded that the distance between the rubber and the points of the conductor, in machines of the common construction, was injurious in its effects, not only by causing the dispersion in part of the electricity excited, but by uselessly wasting the exciting surface. Plates were, therefore, mounted in a very compact and perfect manner, with three pairs of rubbers, placed at equal distances from each other; the conductor also had three arms furnished with points a little in advance of each pair of rubbers, to collect the electricity in the usual manner; and the rubbers were not attached to a surrounding frame, but to brass arms, which, proceeding from a socket through which the axis passes, diverged at equal distances from each other towards the periphery of the plate: the machine has a very compact and neat appearance, and its various smaller parts are contrived with much judgment.

440. In some comparative experiments, made with a plate twenty-two inches in diameter, the superiority of three pairs of cushions over two pairs was very manifest. In the following table the first column expresses the length in inches of the rubbers; the second the length of the spark when two pairs of rubbers were used, and the third the length of the spark when three pairs of rubbers were on the machine.

| Inches. | Inches. | Inches |
|---|---|---|
| 6 | 12 | 18 |
| 7 | 14 | 21 |
| 8 | 16 | 24 |
| 9 | 18 | 27 |
| 10 | 20 | 30 |

### Experiment with a Tourmaline.

441. That the tourmaline possesses electrical properties dependent on its temperature has been long known: the most elegant mode, however, of exhibiting these phenomena has been suggested by Mr. Sivright. If a slice be cut from this mineral, perpendicular to the axis of the prism, and then placed upon a piece of well-polished glass, on being heated to a temperature of 212° it will be

found to adhere so firmly as to support the weight of the slice. The two poles of a tourmaline may also be connected in such a way as to exhibit the effects of attraction and repulsion. To effect which, the oppositely electrified poles are furnished with metallic caps and wires, resembling a horse-shoe magnet; and a light pith-ball, placed between these metallic conductors, is made to vibrate till the electric equilibrium is restored.

### Electricity of a Cat.

442. The electricity, upon rubbing the back of a cat, is well known; and that it is rendered evident by a snapping noise and sparks of light. Mr. Glover, in a letter to the editor of the Philosophical Magazine, describes so intense an action of this kind, as to enable the animal to give a very sensible electric shock. This effect was obtained at pleasure by Mr. Glover, and by some friends. When the cat was sitting on the lap of the person, if the left hand was placed under the throat with the middle finger and the thumb gently pressing the bones of the animal's shoulder, and the right hand was placed along the back, shocks were felt in the left hand; and when the right hand was placed under the throat, whilst the left hand rubbed the back, the shocks were felt in the right hand. When the atmosphere has been favorable, and the cat had lain some time before the fire, the experiment always succeeded.

### Bohnenbergen's Electrometer.

443. This instrument is intended to indicate at once the nature, as well as presence, of electricity. The exterior is formed of a cylinder of glass, about two inches and a half wide: it is closed at the top by a brass plate, from which descend two of De Luc's electric columns, each containing about 400 discs of gilt and silvered paper, about three lines in diameter, and terminated below by brass rings; these tubes are an inch and a half distant from one another, and between them is placed a tube of glass, which, passing through the cover, in the manner of Singer's insulation, supports a wire, terminated below by two gold leaves, and above by a metallic plate. It is easy, from this disposition, to perceive that when the leaves are unelectrified they will hang midway between the tubes; but when affected by the approach of electrified bodies, they will diverge and indicate by the attraction of the leaf on the one side, on the other the nature of the charge.

### Electricity produced by Congelation of Water.

444. When water is frozen rapidly in a Leyden jar, the outside coating not being insulated, the jar receives a feeble electrical charge, the inside being positive, the outside negative. If this ice be rapidly thawed, an inverse result is obtained, the interior becomes negative, and the outside, positive.—*Grothus.*

### Improvement of the Leyden Jar.

445. M. Metzger has varied the construction of Leyden jars, so as to augment their capacity without increasing their apparent volume. For this purpose, having two jars of proper dimensions, he simply places one within the other, so that they shall apply pretty correctly, and thus have a capacity of charge nearly proportional to the whole surface of coating, without increasing the volume of the whole beyond that of the larger jar. Jars made slightly conical would answer well for this purpose.

### Electricity on Separation of Parts.

446. In the water-proof cloths manufactured by M. Mackintosh of Glasgow, where two pieces are cemented together by caoutchouc dissolved in coal, tar, or oil, the adhesion is such, that when the two are torn asunder in the dark, there is a bright flash of electric light, similar to that produced by separating plates of mica, by breaking Rupert's drops, or by breaking barley-sugar, or sugar-candy. Upon trying this experiment with different substances, it was found that flashes of light were distinctly produced by tearing quickly a piece of cotton cloth.

### Electric Light.

447. Having a metallic wire covered with silk, form it into a close flat spiral, taking care that the revolutions touch each other: their number may be arbitrary, more than twenty-four have not been used. The properties of this spiral, when it forms part of the Voltaic circuit, are well known; but pass through it a charge of common electricity, such as may be taken by two square feet of coated surface, moderately charged, and a vivid light, something resembling that of an artificial fire-work, will occur, originating from the centre of the spires: it may be seen very distinctly without darkening the chamber where the experiment is made. M. Leopold de Nobili, who describes this experiment, considers the phenomenon as perfectly new. If the wire be folded backwards and forwards, so as to form a rectangular surface, then the electric discharge only produces a faint light at each corner, and this he considers as the light produced by the escape of the electricity into the atmosphere; but the light from the spiral is said to be so vivid and distinct, that once seen, its dissimilarity from the former must be instantly evident; he has therefore called it electro-magnetic light, because of its relation to the magnetic state of the spiral, thinks that it might be made continuous if a sufficiently powerful Voltaic battery were used, and has little doubt but that the aurora borealis is such a light, elicited by the magnetic state of the earth.

### Electricity excited by the Burning of Paper and Alcohol.

448. M. Becqueral has found, as the result of numerous experiments, that when a roll of paper is set on fire at one end, the flame thereof becomes negatively electrified, and the paper positively. He also found that when alcohol is burned in a copper dish, the latter becomes positively electrified.

### Hare's Single Gold-leaf Electrometer.

449. This instrument consists of a glass vessel, fixed by a foot to a wooden stand, and having an aperture at the top, and also another at one side. The top is closed by a metal cap,

finished externally by a horizontal zinc disc, six inches in diameter, and connected internally with a single leaf of gold, cut into an acute triangular form, and hanging on the centre of the instrument, with the point downwards. Opposite to the lower end of this leaf of gold, is a ball attached to a horizontal wire, and which, passing through a screw cap fixed in the lateral opening of the glass vessel, can be made to approach to, or recede from, the leaf at pleasure, the distance being estimated by a graduation of the screw into $\frac{1}{10}$ of an inch. A plate of copper, six inches in diameter, and furnished with a glass handle, generally accompanies the instrument.

450. The electricity produced by the contact of copper and zinc, is rendered sensible in the following manner:—Place the disc of copper on the disc of zinc; take the micrometer screw in one hand, touch the copper disc with the other, and then lift this disc from the zinc. As soon as the separation is effected, the gold leaf will strike the ball, usually if the one be not more than $\frac{1}{100}$ of an inch apart from the other. 'That the phenomenon arises from the dissimilarity of the metals, is easily shown by repeating the experiment with a zinc disc, in lieu of a disc of copper. The separation of the homogeneous discs will not be found to produce any contact between the leaf and the ball.'

451. 'It is probable that the sensibility of this instrument is dependent on that property of electricity which causes any surcharge of it, which may be created in a conducting surface, to seek an exit at the most projecting termination or point connected with the surface;' this disposition being increased, of course, by the proximity of the ball. These effects are not to be expected in weather unfavorable to electricity; but in favorable circumstances they have been produced by a smaller instrument, the discs being only two inches and a half in diameter.

### Pyro-Electricity of Minerals.

452. M. L'Abbé Haüy has remarked, with regard to the electricity produced in certain crystals by an alteration of temperature, that it is of two kinds. The accidental circumstances which led to the discovery took place whilst he was examining some crystals of the oxide of zinc, from Limbourg, near Aix-la-Chapelle, and fragments of the acicular variety of the same mineral from Brisgau. Having placed a piece of one of these substances in a very cold window for a few moments, it was found, on examination, to be electrical. Its poles were ascertained, and the mineral then placed in a milder temperature, when the electricity soon become null; but, being approached to a fire-place, the power was greatly renewed, but the poles were inverted.

453. These results have been verified by M. Haüy on other crystals, especially those of the tourmaline. In taking them for examples, he has endeavoured to bring under one point of view all that passes with respect to them in the interval comprised between the limits of temperature, beyond which the electric action disappears without return. He has given the name of ordinary electricity to that produced by heat, and extraordinary electricity to that produced by cold. If, therefore, commencing at the point where the excess of heat destroys in the tourmaline the effects of the ordinary electricity, that mineral be left to cool, it will soon give signs of ordinary electricity. The action of the poles at first feebly augments to a certain degree, beyond which it gradually diminishes, and at last disappears. With a temperature a little lower, however, the extraordinary electricity appears, and the poles resume their power, but in an inverted order, so that the pole at first positively electrified becomes negative, and the negative pole becomes positive.

### Electricity of the Atmosphere.

454. M. Bourdet, an ex-captain in the French service, has described in a letter, a very singular electric phenomenon which he witnessed in Poland, December 24th, 1826. The weather, according to the Poles, had never been milder at that season of the year, no snow had been seen, nor had the usual cold weather of the north, which generally set in early in that country, then commenced. Rains and storms, however, were frequent. 'I was,' says M. Bourdet, 'with the advanced guard of light cavalry; the commander gave me an order to halt in the rear and see that my guns were disembarrassed, and then to rejoin, as quickly as possible, the light brigade. In spite of the efforts of my men, the guns were not cleared from the marshy ground in which they were entangled, without great labor. We were advancing across the field about nine o'clock in the evening, when a strong gust of wind suddenly arose, the sun had shone brightly during the day, and, in a few minutes after, the night became so dark that we could not see the heads of our horses. The wind blew so violently that the horses stopped. At that moment the extremity of the hair on their ears became luminous, as well as all the longer hairs on their bodies except the locks on their manes and tails. All the metallic extremities of their harness, and all the metallic sharp points of the carriages of our guns, were studded with luminous points, so that one might have supposed, had it been spring, that a swarm of glow-worms had covered our horses and guns. Our quarter-master observed that the points of my mustachios were luminous. The same phenomenon was seen on some of the cannoneers, but none of us had our eye-lashes or hair rendered luminous. These lights remained as long as the gust of wind lasted, namely, for three or four minutes. Their color was a soft violet, and they terminated in a bright white. The horses held their heads high, their ears were erect and moving, their nostrils open and respiring, their manes and tails erected, their fore legs thrown forward and their hind ones back. Their attitude, in general, was that of animals seized with terror. During the time the wind blew, they remained at a full stop, and, when feeling the spur, some stood stock still, and others kicked, as if they had been reluctant to advance. When the wind ceased the lights disappeared, and a deluge of rain, mingled with hail, fell. But, though the obscurity continued, our horses moved on, shaking themselves at times, panting forcibly, and neighing; but they continued on their march. On arriving at the advanced post, I mentioned

to my comrades the phenomenon we had witnessed, and though they had been only three leagues from us, they felt no wind, but experienced much rain. The wind we encountered had an opposite direction to the rain.

### Relation of a remarkable electrical Phenomenon.

455. The following relation is made by M. Allemand, of Fleuvier Neufchatel, to M. Pictet, and is published in the Bib. Univer. M. Allemand, states that on the 3d of May, about ten o'clock in the evening was caught in a violent storm of wind and rain. The thunder becoming frequent and strong, he thought it proper to close an umbrella he had with him, and hold the upper metallic point in his hand, lest it should attract the lightning. The night, dark of itself, was made more so by the great rain. Suddenly he perceived a light from above, and looking upwards found the edge of his hat luminous. Supposing at the moment the hat was on fire, he, without reflection, passed his hand over the light to extinguish it. It, however, only shone more strongly, a circumstance which caused some confused ideas on the nature of the light. The hand being filled with water from the hat, on shaking it, M. Allemand saw that the interior of it shone as if it were a polished metal reflecting a strong light.

456. Being at this time near the farm of Chaux, about ten or twelve minutes' walk from Fleurin, and fifteen or twenty from Motiers, M. Allemand considered for a moment what he had best do, and concluded on continuing his progress. Having once filled his hand with the electrified water with impunity, he ventured to repeat the experiment, and did it fifteen or twenty times, endeavouring to ascertain whether it had odor, or produced any decrepitation or sound; but nothing of this kind could be perceived; nothing but the bright light, which seemed like a brilliant varnish on the hand. The light remained for an instant only. At a few hundred paces farther on, the light on the hat still continuing, M. Allemand was surprised by the appearance of another light, less bright than the former, on the smooth surface of the umbrella handle, at the place where generally a plate of metal is placed for the name, but which plate had been removed from this umbrella. At first the finger was passed over it to extinguish it, but the phenomena were just as before, and both the rubbing and rubbed surface shone brightly. Afraid of the metal about the umbrella, it was thrown down, and M. Allemand went on his way, rubbing his hat on the sleeve of his coat; but in this way only rendering the light brighter. The thunder was more frequent than before, but still at some little distance. The crown of light continued until M. Allemand arrived near Motiers, and he attributed its cessation to the high poplar trees in the neighbourhood of that place. Stopping at Motiers only a short time, he took a guide with a lantern to find the umbrella. Having done so he sent back the man, and went on himself towards Fleurin. As the tempest had diminished, he used the umbrella; and, as soon as the light of the lantern was sufficiently removed, he again remarked luminous appearances. These occurred at each end of the whalebone ribs, on the metal point which terminates them: the light was not so bright as the electric star, but they were brilliant points like a yellow red metal, highly polished, and would, M. A. remarks, have appeared very beautiful if he had been collected enough to admire them. M. Allemand explains these effects by supposing the atmosphere sursaturated with electricity, and that a portion of it was continually passing to the ground, through his hat, umbrella, and himself.

### Illumination by Electricity.

457. Professor Meinecke of Halle, has, in a late number of Gilbert's Annals, proposed to illuminate halls, houses, and streets, by the electric spark, and expresses his strong persuasion that one day it will afford a more perfect and less expensive light than gas-illumination, and ultimately replace it. His plan is to arrange, what are called in electricity, luminous tubes, glasses, &c., i. e. insulating substances, having a series of metallic spangles at small distances from each other, along the place to be illuminated; and then by a machine send a current of electricity through them: sometimes also partially exhausted glasses, as the luminous receiver, conductor, &c., are used. In this way professor Meinicke obtained from a two feet plate machine a constant light in his apartment, equal to that of the moon, and even surpassing it; and by enclosing his system of sparks in tubes filled with rarefied hydrogen gas, in which gas it is assumed that the electric spark is more than doubled in brilliancy, thinks it will be easy to enlarge the plan to any extent.

# INDEX.

# ELECTRO-GALVANISM.

1. Electro-Galvanism, or Voltaic Electricity, may be said to owe its origin to the discoveries of an ingenious Italian philosopher, named Galvani, who published a Latin treatise on the subject at the close of the last century.

2. In the preceding article we have examined the various phenomena resulting from the friction of dry bodies, which, by their mutual action on each other, tend to destroy their electrical equilibrium; and we now propose to furnish our readers with an outline of that branch of electricity which has led to some of the most important discoveries and splendid triumphs connected with the progress of chemical science.

3. In the year 1790 L. Galvani, professor of anatomy at Bologna, accidentally discovered that the passage of a small quantity of electricity, through the nerve of a frog that had been recently killed, had the property of exciting distinct muscular contractions. He produced the same effect with atmospherical electricity; and afterwards by the mere contact of two different metals. His discoveries were published in 1791: he proved the phenomena to be electrical, and says, 'if you lay bare the sciatic nerve of a frog, and remove the integuments, then place the nerve on a piece of zinc, and a muscle on a plate of gold, and connect these metals by any conducting substance, contractions are produced; but, if nonconductors are used to connect the metals, contractions are not excited.' The experiments of Galvani received considerable attention; they were varied and extended with the greatest perseverance and address by professor Volta, Dr. Valli, Humboldt, Fowler, Monro, Robison, and many others.

4. The effects obtained in the experiments of these naturalists may be illustrated by very simple experiments. The most important facts they establish are, first, that the passage of a small quantity of electricity through the nerve or nerves of any animal, occasions a tremulous motion or contraction of the contiguous muscles, and sometimes an extension of the limbs. This effect takes place both in living animals and such as have been recently killed, and even in the detached limbs of these last. It is produced when the transmitted electricity is too weak to affect the most delicate electrometers, and obtains in all animals for some time after death; their susceptibility being greatest at first, and gradually diminishing as the limbs stiffen. Animals with cold blood, as frogs and fishes, retain the power of action after death longer than others, sometimes for many hours, or even days.

5. Secondly, The same effects that are produced by the passage of electricity, also result from the contact of different metals with the nerves and muscles. If a communication be formed between any nerve and muscle by a single metal, contractions are but rarely produced, and when they appear are very feeble; but if two metals are employed, in contact with each other, motion is always obtained, and the effects are most considerable when the metals are most essentially different; thus zinc and gold or zinc and silver, form a very active combination.

6. Thirdly, By the same means that muscular motion is excited in these trials, some of the senses are remarkably affected, as will be evident when the experiment is made on living animals.

7. The demonstration of these facts is easily effected. For the excitation of muscular motion any small animals may be employed; the most convenient are frogs and fishes. Frogs are peculiarly susceptible. If one of these animals be employed alive, a piece of tin-foil may be pasted on its back, and the frog being then placed on a plate of zinc, spasmodic convulsions will be produced whenever a communication is made by a wire between the zinc and the tin-foil. This experiment will succeed either in the open air or under water.

8. M. Valli, an Italian physician, was one of the earliest to enter on a series of Galvanic experiments, which he began by those that relate more immediately to animal electricity. The results of these experiments he communicated in 1792 to the French Academy of Sciences, by the members of which the experiments themselves were so much approved, that the greater part of them were shortly after repeated in the chemical laboratory of Fourcroy. They were as follows:—

9. Experiment I.—Two metallic coatings, one of lead the other of silver, were placed on a frog fastened to a table, the former on the belly of the animal, the latter on the pelvis. These metallic coatings having been brought into union by the means of an exciting arc of copper, very powerful convulsive movements were produced in the animal.

10. Experiment II.—The small sheet of lead, employed as one of the coatings in the former experiment, having been removed, so as to leave the abdomen bare, and the exciting arc applied in the same way as before, the convulsive movements took place but were not so sensible as in the other case.

11. Experiment III.—In employing two coatings of the same metal, silver or gold for instance, it was found that the effects produced by the exciting arc of copper were much weaker. When these coatings were not only of similar metals, such as copper, lead, tin, zinc, &c., but the exciting arc also, no effect was produced.

12. Experiment IV.—The coating placed on the abdomen having received an horizontal direction, insomuch that the points of contact were less numerous, the effects were proportionably diminished. As soon, however, as the coating was brought into full contact with the surface of the abdomen, they became as powerful as before.

13. Experiment V.—A frog having been skinned, and cut transversely through the middle, the nerves of the thighs were laid bare, united, and placed on a piece of gold, at the same time that the thighs themselves were brought in contact with a piece of silver. On the application of the exciting arc of copper, slight movements

were produced; as they also were when both the coatings were of silver. But when a coating of tin, lead, or copper, was substituted for the one of silver, in which the nerves were enveloped, the movements became very violent. The following gradation was, however, observed in the action of the metals: the lead produced the most powerful movements; next the tin; and, lastly, the copper. In proportion as the vitality of the frog was diminished, the metals also lost the power of governing the direction of the progress of the electric fluid in the animal. The lead, tin, and zinc preserved this property the longest.

14. Experiment VI.—Plumbers' lead, placed on each side as a coating, produced no effect when employed with an exciting arc of the same description of lead; but when different qualities of this metal were selected, such, for instance, as the lead of the assayer, and plumbers' lead, an exciting arc of either of these descriptions of metal produced very singular effects. When these two kinds of lead, in changing the different metals, were no longer productive of any effect in one of these coatings, by substituting for the lead either silver, gold, bismuth, antimony, or zinc, movements of so powerful a nature were obtained, as to enable the animal to be susceptible of slight convulsions, when the above-mentioned pieces of lead, each of them of a distinct kind, were again applied.

15. Experiment VII.—A short interval of repose having been allowed to the frog, it was found to be susceptible of convulsive movements of a forcible nature, when again subjected to the same trials.

16. Experiment VIII.—The electric power being nearly exhausted in this animal, it was found that the different metals, when they produced by their contact new convulsions, did not, on this effect ceasing, leave to the animal the faculty of displaying fresh movements with the coatings of the different kinds of lead.

17. Experiment IX.—Lastly, the electric action disappeared totally in the following order, the plumbers' lead invariably forming one of the coatings: the assayers' lead first ceased to determine the action; next the tin; next the antimony; next the zinc; next the copper; next the gold; and finally, the silver. It ought here to be noticed, that the iron had lost its exciting quality before the antimony; but it was not ascertained whether it had likewise been deprived of that quality before the lead and the tin.

18. Experiment X.—The zinc, in losing the exciting property by which convulsions had been produced on the frog, which had been subjected to the experiment for the space of an hour, was not capable of determining any farther movements when the leaden exciting arc was placed on it. It was however remarked, that movements were still produced by this metal, the moment the person engaged in the experiment removed the exciting arc, and destroyed the communication. This singular experiment was so often repeated, as not to leave any doubt respecting the result.

19. Experiment XI.—The upper part of a frog, skinned and intersected transversely, having its crural nerves armed with a piece of lead, as in the preceding experiments, was placed in a glass filled with water, while the inferior part of the animal was placed in another glass. The different parts displayed very powerful movements when the communication was established, by the means of a chain formed by the persons present, two of the persons present having been selected to touch, each of them, the water in one of the glasses. One of these individuals held in his hand a bit of metal, which he brought in contact with the coating of lead.

20. Experiment XII.—When one of the company withdrew himself in such a way as to interrupt the chain, the movements were no longer perceptible.

21. Experiment XIII.—The parts of the frog having been placed in the two glasses, as in Experiment XI., the operator could not excite any movement by establishing the communication with his two fingers. He was equally unsuccessful when, with one hand armed with a piece of metal, he touched the body of the frog, while he placed a finger of the other hand on the metallic coating of the crural nerves. But when, having a finger placed on the inferior part of the frog, he presented the piece of metal to the coating of the nerves, very powerful movements were excited in the animal.

22. Experiment XIV.—When the frog was touched with a metallic exciting arc, in an insulated state, no sensible effect was produced; but, when the metal ceased to be insulated, the effect was invariably very considerable.

23. Experiment XV.—One of the fore legs of a rabbit having been detached from the body, the brachial nerves were denudated, and armed with a piece of sheet-lead. A piece of silver, which was to act as an exciting arc, was afterwards laid on an adjacent muscle; and the result was, that very violent convulsive motions were produced in the animal. In this experiment on the rabbit, as it was afterwards varied, one of the coatings being of plumbers' lead, and the other of assayers' lead, the movements were no longer excited. When they consisted, the one of lead, and the other of iron, they produced as little effect; but when the lead, as one of the coatings, was tried with another coating, either of silver, gold, copper, zinc, or antimony, convulsive movements were produced. Combined with a coating of bismuth, the coating of lead produced but very slight movements.

24. Experiment XVI.—To ascertain the state of the electricity inherent in the animal subjected to the experiment, it was plunged into a vessel containing one of Coulomb's electrometers, and successively electrified both positively and negatively. In either of these cases the animal influenced the balls of the electrometer, so as not only to evince that the electricity was in a perfect state of rest, as well before as during the experiment, but also, that the system of the body on which it was made, presented in the most marked and striking manner, the phenomenon of a Leyden phial.

25. Experiment XVII.—The left crural nerve of a living frog having been bound by a strong

ligature, the animal lost the faculty of moving, in a natural way, the part beneath the point where the ligature was tied. The nerve, however, having been armed in the same manner as in the preceding experiments, the movements were excited as soon as the communication was established between the muscle and the part above the ligature.

26. Experiment XVIII.—The ligature having been made on the left crural nerve, sufficiently near to the muscle to be in contact with it, and on the right crural nerve in such a way as to render it disengaged and visible, the left part of the animal being in a palsied state, remained perfectly motionless, whilst the convulsive movements excited by the communication were all of them confined to the right side. The above-mentioned left crural nerve having been afterwards more effectually denudated, and separated from the muscular substance by which it was surrounded, recovered its quality as a conductor, and permitted the movements which were communicated to display themselves with considerable energy. When the ligature was forced back against the muscle, the limb again lost the faculty of motion.

27. Experiment XIX.—One of the crural nerves having been armed with a piece of sheet-lead, a communication was established between this nerve and the other crural nerve in an unarmed state. The result was, that very powerful convulsive movements were produced.

28. Experiment XX.—One of the above nerves, coated with two pieces of lead, at different intervals of the muscle, was violently agitated as soon as a communication was established between the two parts by the means of an exciting arc. The same effects were observed, notwithstanding every part of the nerve was laid bare, and separated from the surrounding muscle.

29. The earliest experiments undertaken by M. Humboldt were made in the presence of M. Venturi, professor of natural philosophy at Modena, and several medical students. The brain and spinal marrow of several frogs having been laid bare, and the animals properly armed, powerful contractions were produced, by the application of the galvanic arc, in the muscles of the thorax and abdomen, together with slight contractions of those of the thigh. Violent convulsive movements of the eyes were at the same time perceived. The diaphragm, a muscle which is in all cases extremely sensible to galvanic irritation, was also powerfully contracted. As soon as the femoral and sciatic nerves had been irritated, violent contractions were produced in the thigh. The experiments on the heart and stomach were attended by but little effect. When, however, they were made on the heart of a dog, separated from the animal, and which had ceased to contract, that action was, in a certain degree, renewed; and, in the case of the stomach, a feeble motion was induced in the parts touched by the zinc. These experiments were afterwards repeated with pretty nearly the same results.

30. As the efficacy of the different substances calculated to bring about the galvanic phenomena, and the modifications they induce, had attracted the attention of naturalists much more than the effects of galvanism itself on the animal economy, Humboldt determined to direct his experiments more particularly towards the latter. The cause of galvanism ap earing to him to reside in the body of living animals, and to be merely excited to action by extraneous substances, he was of opinion that the strongest light would be thrown on this subject by observing the phenomena the animal should present. Seeing that the magnetic and electric fluids, which are neither peculiar to the living body, nor secreted in its organs, as the galvanic fluid appears to be, have, notwithstanding, a decisive influence on the human body, as well in a healthy condition as in a diseased state, ought it not, he argued, to be concluded that galvanic researches are equally interestng to the physician and to the naturalist, insomuch that the former has a right to hope that galvanism may one day be usefully employed in the cure of particular diseases? and he adds, 'In the science of galvanism, as well as in every branch of natural philosophy, facts alone are stable and certain.'

31. The following are the conclusions drawn by Humboldt from his early experiments.

32. (1.) That the effects of galvanism are almost invariably different on different parts of animals; and that multiplied and well combined experiments on this subject may furnish a tolerably correct appreciation of the respective forces of the different extensor and flexor muscles.

33. (2.) That in animals with warm blood, the diaphragm is, of all the muscles, if not the most powerfully, at least the most easily irritable, it being the only one which constantly contracts with violence in the experiments without a chain. This may lead to a knowledge of the respective degrees of irritability residing in the different muscles.

34. (3.) That the living nerves and muscles are surrounded by an active and sensible atmosphere; and that the action of the nerve extends beyond the points at which they are distributed.

35. (4.) That galvanism is capable of exciting movements in the organs which are altogether independent of the will, such as the heart and stomach.

36. (5.) That the galvanic fluid, proceeding from an animal with warm blood, may act efficaciously on the human nerves.

37. (6.) That the galvanic phenomena take place without the intervention of any external body, which proves that the cause by which they are produced resides in the living animal economy.

38. (7.) That these phenomena may be made apparent by the means of a chain established between two points of one and the same nerve, as well as in the organs brought in contact with any part of the chain.

39. (8.) and lastly. That by the discovery of galvanism, anatomists are supplied with the means of ascertaining, in small animals, the nervous distributions which are too minute for dissection. From a comparison between many of the phenomena of living bodies with those of dead matter, Humboldt conceived the idea of

instituting a series of experiments by which vitality should be, as it were, subjected to a chemical analysis.

40. M. Humboldt's attention having been directed to other objects for more than two years, he did not think of publishing his experimental observations, until the work of our countryman, Fowler, on the galvanic influence, enlightened him as to the result of his experiments, which he had hitherto apprehended to be peculiar to himself, at the same time that similar ones were made by other naturalists; such, for instance, as the experiment of Mr. G. Hunter of York, which consisted in perceiving the flash of light without any contact of metals with the eyes. Humboldt now began to collect all that had appeared on this subject, from the origin of the discovery, and to compare this information with what he had himself observed. On reading the excellent production of Pfaff on animal electricity and irritability, he found, in the very considerable number of experiments it contains, and in the important observations by which they are accompanied, results exactly similar to those with which his own experiments had supplied him, notwithstanding a very different mode of investigation had been pursued by their author. He was now obliged to renew his labors, and to suppress at least one-half of his experiments.

41. By the observations of Messrs. Jurine, Pictet, Scarpa, Tralles, and Volta, in whose presence they were made, he corrected his ideas; and their reflections conducted him to new researches. After having collected all the observations on irritation, and on the incitability of the sensible and irritable fibre, he began with the history of galvanism, as it led to the other researches. Finding it unnecessary to go into any length of detail, in penning down his observations, the results alone being of importance, he has contented himself with pointing out the principal ones, in a loose way, and in the order in which they presented themselves to him. This work is divided into ten sections, which, after the introductory matter already given in substance, form a kind of table of the subjects they discuss, and of which the following is a brief, but faithful, analysis.

42. In the first section the author expatiates, in general terms, on the relation between galvanic irritation and incitability, and on the different degrees of the former, which, he observes, act exclusively on organic parts provided with sensible fibres. The indirect effects on inanimate matter, connected with incitable bodies, have not, as yet, been experimentally demonstrated. Humboldt, with great care and attention, caused the galvanic fluid to pass through colored liquors, and through other liquors saturated with salt. These experiments he repeated with great assiduity, but could never observe the smallest alteration in the color, temperature, evaporability, or crystallisation of the fluids in question, on the chemical combination of which he could not perceive any change to have been effected. It did not produce any sensible effect either on the electrometer, or on the intermediate rings of the galvanic chain, so as to indicate its strict analogy with the electric fluid.

43. In his investigation of the effects of a metallic stimulus on the irritable and sensible fibre, Humboldt was very solicitous to ascertain the degree of irritability and incitability, which has as powerful an influence on the success or failure of the experiments, as the degree of force of the stimulus itself. In experimenting, he therefore made choice of the most incitable animals, and found that the frogs best calculated for his purpose were young and vigorous females, taken immediately after their winter slumber, and fed, together with other frogs, for some days in a warm room. By the help of art he contrived to carry the incitability to a higher degree than is remarked in the natural state; and this discovery may be considered as one of the most important that he made. By bathing the nerves of animals with a solution of alkaline salts, or with the oxygenated muriatic acid, he not only obtained results which had not previously been known; but also noticed phenomena, the possibility of which had been denied.

44. A short time after the appearance of Humboldt's great work, M. Pfaff published an interesting memoir on the subject. 'It cannot be questioned,' says this writer, 'but that vital chemistry, which appears to be the favorite object of the meditations of the physiologists of the present day, has been elucidated, as well as greatly extended in its limits, by Humboldt's experiments on the excitability of the muscles and nerves. The indefatigable zeal employed by that writer, together with the sagacity and spirit of observation of which he has given so many conspicuous proofs, in a multitude of researches on physiology, must necessarily have led him to very interesting results. The inferences, however, which he draws from his experiments, as well as the explanation he gives of the phenomena he has observed, are not invariably fixed on a solid basis.'

45. The very remarkable effects produced by chemical substances on the sensible and irritable fibre, are, according to M. Pfaff, susceptible of an explanation different from the one adopted by M. Humboldt. It is for this reason that the former proposed another, which he thought more just, and, at the same time, more coincident with the different phenomena of galvanism. The following are his reasonings on this head, together with the experiments on which they are founded.

46. 'A very important circumstance,' he observes, 'to which Humboldt did not pay attention, in his experiments relative to the influence of chemical substances, as exciters of irritability is the effect of them as members of the galvanic chain. Among these substances may be enumerated the different alkaline substances, acids in general, the oxygenated muriatic acid in particular, and liver of sulphur. I have examined them, in the above point of view, in a series of experiments, and have found several of them to be as efficacious links of the chain, and as powerful exciters of galvanism, as metallic substances themselves.

47. 'The table published by M. Humboldt, of the intermediate links of the chain of his boasted exciters and conductors of animal ele

tricity, should be entirely altered, if it be intended to represent the scale of the conducting and exciting forces of these substances, in whatever relates to galvanism. Liver of sulphur, the alkaline solutions, lime-water, and the oxygenated muriatic acid, ought to be ranked before all other substances, metals and charcoal excepted, and immediately after them. The blood also should be considered as possessing a great degree of energy. I have convinced myself, by repeated experiments, made attentively, and with the most scrupulous exactitude, that alkaline solutions, lime-water, the oxygenated muriatic acid, and, more particularly, liver of sulphur, produce, when brought into reciprocal action, effects equally powerful with those of two heterogeneous metals; and that, in all the cases in which the recurrence of the contractions is ascribed to an increase of irritability, produced by a chemical action, it would be much better to ascribe this effect to the irritating property of these substances, as they constitute a part of the galvanic chain.

48. 'They form, in a manner, a series of metallic exciting arcs; and ought to be ranked among those which have the greatest affinity with metallic substances, that is, with zinc and lead. It is on this account that their effects are so obvious, when they are combined with gold, silver, and metallic minerals. They are also very efficacious in the reproduction of the contractions, when, instead of being applied in an immediate way to the nerves, they are simply made to correspond with them by the means of conductors. The blood and the bile ought also to be comprehended in the same class, although their effect may not be equally powerful.

49. 'It is well known that it suffices, for the production of convulsive movements in a very irritable frog, to employ a homogeneous metal, for instance a silver discharger, by which a communication is formed between the muscles and the nerves. These convulsive movements are principally produced by the metals denominated noble; but, more especially, by metallic minerals, such as pyrites and galena, or sulphuric ore of lead. When I had formed a communication between the nerve and the prepared thigh of a frog, by the means of a piece of pyrites, the convulsions were produced, and were more particularly manifested when that substance touched the blood-vessels belonging to the nerves. When a chain was established in the thigh, and the mineral substance and nerve had ceased to produce any effect, the convulsions were reproduced, although feebly, by interposing in the chain a piece of moistened sponge, which formed, in a manner, a coating to the nerves. These effects were not usually, however, of any long duration. By moistening, afterwards, the nerve with a drop of blood taken from the frog subjected to the experiments, or, what amounts to the same thing, from any other, and afterwards touching the blood in question with a metallic exciter of silver or copper, placed on the thigh, very powerful convulsions were instantly produced.

50. 'Here the susceptibility of irritation was evidently augmented by the moistening of the nerve with the blood. It was even so to such a degree, that a galvanic irritation of the feeblest kind became very powerfully augmented. This augmentation of the contractions was not, however, to be ascribed to an immediate influence of the blood on the nerve, or on the irritability seeing that the same phenomena were manifested, precisely in the same way, when the blood, instead of being immediately applied to the nerve, was simply laid on a bit of sponge, or on any other conducting body, placed over it. The success of the above experiments depended entirely on the immediate contact of the blood; since, whenever the nerve, or the sponge, was touched at the parts distant from it, the effect did not ensue. To the presence of the blood ought more particularly to be ascribed the properties of animal substances, considered as members of the galvanic chain.

51. 'In this latter point of view, the heart of the frog, still replete with blood, displayed very singular effects, at a time when the irritability was extinguished to such a degree, that certain heterogeneous metals, such as gold and silver, or silver and copper, no longer produced any effect when brought in contact. I was enabled to reproduce very forcible contractions, by placing the heart of a frog on its nerve, and by forming a communication between it and the thigh of the animal, by the means of a metallic exciting arc either of gold or silver. In this manner I established a galvanic chain, in the composition of which one metallic exciter only was to be found. In another instance, it was very remarkable, that the moment the heart was touched, either by silver or by pyrites, it remained tranquil, notwithstanding the thigh of the animal was in a convulsed state, the regularity of the system of the pulsations not being in any degree interrupted. Other parts of the frog, for instance, portions of its liver, its bowels, &c., which contain a less proportion of blood, did not possess an equal efficacy; but the heart itself was surpassed by the blood presented in substance, and more particularly in a concrete state. It was surprising to see the mode in which I could, by the means of a drop of blood, bestow on the nerve its vital energy; and also to observe that this drop of blood, without undergoing any sensible diminution or change, still continued to render the same service.

52. 'Whatever may be the effect, however, which the blood produces, it is still surpassed by the alkalies, by the oxygenated muriatic acid, and, more particularly, by the liver of sulphur, when metallic exciters of the first class, that is, the minerals and noble metals, together with the other metallic substances, and the regulus of antimony, cease to produce any effect, in conjunction with the blood with which the nerve has been moistened. After having wiped it dry, and substituted for the blood a single drop of the deliquescent oil of tartar, very powerful convulsive movements may be produced, by a recurrence to the above metallic exciting substances. This galvanic chain, consisting of muscles, silver, pyrites, or regulus of antimony, and of an alkali and a nerve, is as efficacious as a chain formed by muscles, silver, iron, or tin, conjointly with a nerve. The deliquescent oil of tartar

may be considered as an active coating of the nerve. These phenomena present themselves agreeably to the same identical laws by which the metallic coatings of the nerves are regulated. In the above process, the deliquescent oil of tartar possesses nearly the same activity, whether the nerve, without being moistened in an immediate way, is made to communicate with the muscles by the means of any conducting body whatever, or is immediately touched by the metallic exciter applied to the thigh of the animal, the exciter in question being a bent silver probe.

53. Professor Pfaff goes on to say that 'the following experiments merit a particular notice. I laid a portion of muscular flesh on the nerve of a frog, on which two heterogeneous metals, silver and copper, had ceased to produce any effect, and having touched the nerve with a silver probe, which was applied to the thigh, was not enabled to produce any contractions. I now poured a drop of the deliquescent oil of tartar on the muscular flesh, and, as soon as the silver probe was brought in contact with this alkaline substance, very strong convulsive movements were displayed. I laid another portion of muscular flesh on the preceding one, and brought the exciter towards it, but without being enabled to produce the contractions. Scarcely, however, had this latter portion of muscle been moistened and touched, as in the former instance, than they were renewed. In this way I was enabled to form several layers of a different nature; and the effect above pointed out took place as often as the silver, or, what was still better, the pyrites and the regulus of antimony, came in immediate contact with the alkali. The nerve having been moistened with the deliquescent oil of tartar, a very feeble galvanic irritation, produced either by gold and silver, or by silver and copper, became highly exalted, even when the convulsions had not been previously excited. It remains, however, to be ascertained, whether, in this case, the deliquescent oil of tartar did not act as the most efficacious coating of the nerve. It is in this way that silver and copper produce fresh contractions, when, after the nerve has been coated with zinc, and the thigh of the animal laid on silver, a communication is formed between them by the means of copper. In such a case, indeed, the effect is not owing to the joint operation of the copper and silver, but, on the other hand, to that of the silver and zinc, by which the humid animal parts are immediately coated. Would not an effect exactly similar be produced, if the nerve were to be moistened with the deliquescent oil of tartar? Does not this alkali, in surrounding the nerve, become a more efficacious coating than the zinc; and, on the application of feeble exciters, such as copper and silver, does not the zinc itself act more powerfully by the means of an alkali, with which it is simply connected by the copper, as an intermediate conductor?

54. 'These doubts are very far from being removed by M. Humboldt's experiments. Supposing the deliquescent oil of tartar to act by producing an augmentation of irritability, this effect ought also to be produced when the nerve has been carefully dried, before the application of a weaker galvanic irritation is made. This, however, is what I have not found in any of my experiments. M. Humboldt constantly applied his weakest exciters, whilst the nerves were still moistened with the deliquescent oil of tartar, or with any other chemical substance calculated to augment the susceptibility of irritation. On this head, let the different parts of his work in which he treats of the increase of this susceptibility by the alkalies, be compared. He sets out by saying: 'I showed the galvanic flashes to several persons who could not perceive them in the experiments made by Mr. G. Hunter, by rubbing their gums, on the upper jaw, with an alkaline solution. Two pieces of gold, applied to wounds on the back, were found to possess great efficacy, when the wounds had been touched with the deliquescent oil of tartar.' A little farther he observes: 'When the principal trunks of the nerves of an organ are carefully prepared, and enveloped in moist bits of bladder, in such a way as that the irritating humidity simply moistens the muscular flesh, and the few fine nervous filaments it contains, an increase of irritability is rarely to be observed, at the same time that it is constantly produced, when the above principal trunks are moistened beneath the muscles.' Again, he says in the following page: 'The vital principle will be restored in the thighs of frogs exhausted by galvanic experiments, by the means of the oxygenated muriatic acid, in such a way as that the irritation of metals will again produce its effect. It is remarkable, that the contractions become more powerful, when a great portion of the nerve is moistened, and touched directly by the silver.' Such are the extracts I have chosen to cite from Humboldt's work. Now, let it be observed, that, in all the above cases, and more particularly in the experiments relative to the influence of chemical substances on the irritability of the animal fibre, the nerves were constantly moistened by these substances. They must consequently, whenever the metals were applied, operate likewise as links, or members, of the galvanic chain. The consequences must therefore be uncertain at the least.

55. 'I could not observe any remarkable difference in the alkalies, considered as links of the galvanic chain. The deliquescent oil of tartar appeared, however, to be somewhat more efficacious than the other substances of this nature. The effects of lime-water were not so powerful: it appeared, as it were, to preserve a medium between the alkalies and the substances to which an inferior rank is assigned. The oxygenated muriatic acid appeared to be pretty nearly as active as the deliquescent oil of tartar. In a few cases only the latter fluid produced spasmodic contractions of a longer duration. I observed likewise, in several instances in which I employed the oxygenated muriatic acid, a phenomenon which the metallic coatings of the nerves had often displayed, namely, that the contractions were manifested at no other time than when the contact of the nerve, moistened with a drop of the oxygenated muriatic acid, ceased. Here, likewise, the effects seemed to depend entirely on the immediate presence and application of

the oxygenated muriatic acid. As soon as a drop of this liquid is poured on a portion of muscular flesh, laid on the nerve, the movements are invariably reproduced.'

56. Having entered into this detail of the objections of M. Pfaff to the theory of Humboldt, we may now proceed to the analysis of a very curious memoir, read by M. Lehot at the French National Institute. Its object is to demonstrate particularly, not only the circulation of a very subtile fluid in the galvanic chain, but likewise that, in the application of the different chains to the animal arcs, there are unequivocal signs of the direction of the motion of that fluid, insomuch that it is possible to determine a priori, in a considerable number of different chains, the direction of the current. Being acquainted with this direction, as well as with the nature of the different parts of the chain, the author of the memoir in question observes, that it is reciprocally possible, in certain cases at least, to determine their respective position; and also, by the interposition of new substances in the chain, or by a change in the disposition of the parts of which it is composed, to give a particular direction to the galvanic fluid, and even to bring it into a state of repose.

57. The comprehension of these phenomena is connected with a fact which seemed to have escaped the notice of the different physiologists, namely, that the galvanic fluid is accumulated in the passage from the organs to the coatings. By a due attention to this fact, the nature of the metallic substances may likewise be distinguished at the distance of several yards. The galvanic influence will be sufficient to determine this. The following are the principal results of the interesting experiments made by M. Lehot.

58. Experiment I.—If the thigh of a frog recently prepared be held in one of the hands, and the nerve be brought in contact with a piece of zinc, the extremity of which is immersed in mercury, the moment the fingers of the other hand are dipped in that fluid powerful contractions will be manifested in the thigh of the animal. The same result will be obtained as often as one of the following substances, namely zinc, lead, tin, mercury, bismuth, copper, silver, or plumbago, is employed as a coating to the fingers; and one of those by which it is preceded, in the foregoing series, as a coating to the nerve. With respect to the precaution of moistening the fingers, it is absolutely indispensable; for which reason, whenever they are described as terminating one of the extremities of the arc, they are to be constantly supposed to be in a humid state.

59. Experiment II.—If, on the other hand, the nerve be brought in contact with the mercury, and if that metal be touched with a piece of zinc, held in the moistened hand, either the contractions will not be produced, or they will be extremely feeble, provided there still be a certain share of susceptibility in the part. By separating, however, the nerve from the mercury, or, in general, by breaking the chain at any given point whatever, the contractile movements will take place. The same results will be obtained, as often as one of the metals belonging to the series pointed out in the preceding experiment, is employed as a coating to the fingers; and one of those by which it is followed in that series, as a coating to the nerve. Thus, if the nerve be coated with lead, and the fingers with zinc, there will not be any contraction when these two metals are brought in contact; but, if the chain be destroyed at any given point, the contractions will be manifested. If, on the other hand, the nerve being still coated with lead, the fingers be coated with silver, when the chain is formed, the galvanic contractions will take place.

60. Experiment III.—If a flat surface of zinc be laid on the tongue, and touched with a piece of silver, held between the moistened fingers, a particular savor will instantly be perceived. Much has been said on the subject of this phenomenon, but it has been nowhere noticed, that it likewise takes place whenever the tongue is coated with any one of the metallic substances pointed out in the first experiment, and the fingers with one of those by which it is followed in the series. If, however, after the chain has been formed, it be interrupted, the savor will be no longer manifest.

61. Experiment IV.—If a piece of silver be laid on the tongue, and a portion of zinc be held between the moistened fingers, as soon as the latter is brought in contact with the silver, there will not be any distinguishable sensation, or, at the least, it will be very slight. As often, however, as the chain is interrupted in any given point whatever, the savor will be perceptible. It will not in this case be so strong as in the preceding experiment, and will be more slowly communicated.

62. The same result will be obtained, as often as one of the metals pointed out in the first experiment is employed as a coating to the tongue, and one of those by which it is preceded in the list, as a coating to the fingers. Thus, by coating the tongue with lead, and the fingers with zinc, and by bringing the two metals in contact, the savor will not ensue; but, by interrupting the chain at any given point, it will be very perceptible. On the contrary, if, the tongue being still coated with the lead, the fingers be coated with silver, instead of zinc, and the chain established, the sensation will be instantly perceived.

63. Experiment V.—If the thigh of a frog be laid on a plate of silver, and the nerve on a surface of zinc or lead, the moment the coatings are brought in contact, powerful contractions will be produced. The same thing will happen whenever the coating of the nerve is made to consist of a metal selected from among those which are pointed out in the first experiment; and that of the muscle, of another metal following it in the series.

64. Experiment VI.—If the muscle be armed with zinc, and the nerve with silver, the contractions will not ensue until the moment the chain is interrupted. When portions of copper, iron, bismuth, and lead are substituted for the silver, the same results are obtained.

65. In the first, third, and fifth, of the preceding experiments, it must have been observed, that

the phenomena were manifested the moment the galvanic circle was formed. The fluid contained in the part of the chain was put in motion, and penetrated instantly either to the tongue or to the nerve. By reversing the chain, a contrary direction must have been given to the current, seeing that the phenomena which were manifested in the second, fourth, and sixth experiments, that is, those in which the galvanic influence was not perceptible until the instant when the chain was interrupted, were to be ascribed to a portion of the fluid, accumulated either in the tongue or in the nerves, at the points of contact of these organs with their coatings. Now, to the end that the fluid should have been thus accumulated, it was necessary that it should have penetrated the above organs in the direction of the muscle towards the nerves, or of the fingers towards the tongue. It is thus demonstrated, that the accumulation of the fluid is a sure characteristic of the direction of the current, by the help of which it may in all cases be determined.

66. In conformity to the experiments which have been detailed above, and to the galvanic facts previously known and established, it would appear that the following principles may be laid down.

67. (1.) That all exciting substances contain the galvanic fluid; but that its quantity is very considerable in humid substances, and in the organs of animals, which have a very small capacity for that fluid, when compared with metallic substances.

68. (2.) That, when two exciting substances are brought together, a new distribution of the galvanic fluid takes place; the substance which has the least capacity losing a portion of the fluid, on which the other substance seizes. Metallic and carbonated substances, disposed in the following order,—zinc, lead, tin, mercury, bismuth, copper, silver, and plumbago, act in such a manner as that any one of them, when brought in contact with one of those by which it is followed, seizes on a portion of the fluid the latter contains.

69. (3.) When the galvanic fluid penetrates the tongue, in directing itself from its extremity towards its root, it causes in the latter part a particular savor, which is more or less strong, according to the greater or less quantity of the fluid, and to the susceptibility of the organ. But when its direction is such, that it tends to flow out of the animal arc by the tongue, it occasions a much weaker savor, which differs from the former in proportion as the quantity of the fluid put in motion is less. As the fluid, however, finds some difficulty in quitting the tongue, it partly accumulates in that organ; and when the cause that has given rise to this accumulation ceases, then the fluid, in returning towards the root of the tongue, occasions there the galvanic savor in question.

70. (4.) When the galvanic fluid, distributed by the nerves, penetrates into the muscular substance of the organs of living animals, recently separated from the animals themselves, contractions are produced in the parts it permeates. The susceptibility being exalted, if the fluid inherent in the organ should, from any cause whatever, be unequally distributed, and accumulated at the particular points, muscular movements will ensue. But if the susceptibility is weakened, the contractions can no longer take place, unless by the aid of a fluid extraneous to the organ.

71. At the earliest stage of the diminution of the susceptibility of the organs, the contractions are displayed, whatever may be the direction of the fluid by which they are permeated. But when the susceptibility is weakened still more, the direction of the current ceases to be indifferent. When the fluid is directed in such a way as to pass from the nervous ramifications to the nerves themselves, the contractile movements are much weaker than when it receives a contrary direction; and in the former case a portion of the fluid becomes accumulated at the point where it has a tendency to flow out from the nerve. This accumulation, and this difference in the effect of the current, by which the organ is penetrated in one direction or in another, are greater in proportion as the susceptibility is less, and as the quantity of the fluid put in motion is smaller. Thus, when the susceptibility is greatly enfeebled, notwithstanding the contractions may ensue, when the fluid penetrates into the organs, in the direction leading from the nerve to the muscle, they cease altogether when it permeates them in a contrary direction, it being then almost completely accumulated in the organ. The cause which has given rise to this accumulation having ceased, the fluid returns into its accustomed channel, and, having penetrated the organs in the most favorable direction, occasions in them the muscular movements.

72. (5.) If a communication be established between two points of an animal organ, with the help of a chain composed of different substances, disposed in such a way as that it may not be symmetrical, relatively to the nature of the parts of which it is composed, the fluid, being unequally solicited on the one hand and on the other, puts itself in motion, and forms a current directed towards the preponderating force.

73. (6.) If all the parts of the chain, by which a communication is established between two points of a system of organs either nervous or muscular, be reversed, a current will be produced having a contrary direction to the former.

74. (7.) When the chain is symmetrical, relatively to the nature of the parts of which it is composed, the fluid, being equally solicited on all sides, will forbear to display any movement.

75. (8.) and lastly. When a chain, which is calculated by its nature to give motion to the galvanic fluid, is destroyed, that is, when an insulating body is interposed, the fluid, which had been accumulated in the organ by the formation of the chain, returns to its original situation, and a current is formed into a contrary direction to the first.

76. These principles, which form the basis of M. Lehot's theory of galvanism, are likewise confirmed by the following experiments:—

77. If the thigh of a frog be held in one of the hands, and the nerve coated with zinc, at the same time that the person who makes the experiment has his tongue armed with silver, the

thigh of the frog will contract as soon as the two metals are brought in contact; but the experimenter will not be sensible of any savor, or of a very slight one at the most. By interrupting, however, the chain, he will perceive a very distinct savor, and the thigh of the frog will cease to contract. If, on the other hand, he coats his tongue with zinc, and the nerve with silver, the peculiar taste will be manifested at the moment of the contact; and the thigh, provided its incitability has been weakened, will preserve a state of perfect immobility.

78. By the interruption of the chain, the muscular movements will be again apparent, without any manifestation of the galvanic taste. It will appear that this ought necessarily to happen when it is considered that, as soon as the chain is formed, the current of the fluid takes a direction from the silver to the zinc, and, having penetrated in a direct and immediate way into the nerve, produces contractions in the muscle, at the same time that it crosses the body of the person by whom the experiment is made, and accumulates on his tongue, without his being sensible of any particular savor. When, however, the chain is interrupted, the accumulated fluid returns to the parts it had quitted, and the savor on the tongue becomes manifest. If the tongue be coated with zinc, and the nerve with silver, the current being impelled in a contrary direction, the phenomena which take place are diametrically opposite.

79. If two persons, holding each other by the hand, arm the tongue, one of them with zinc, and the other with silver, as soon as they bring the two metallic substances in contact, the one who has the tongue coated with zinc is sensible of the savor; but this does not happen to the other. If they afterwards separate the zinc from the silver, the one who felt the savor at the time when the chain was formed, will cease to be sensible of it on its being thus interrupted; at the same time that it will be rendered manifest on the tongue of the other.

80. Finally, the animal arc may be terminated by two nerves. Thus, by placing the two thighs of a frog on a plate of glass, and establishing a communication between their muscles, by the help of a flat piece of metal, coating, at the same time, the nerve of one of them with zinc, and the other with silver; the thigh which is armed with zinc will contract the moment a communication is established between the two coatings, by the means of a rod of zinc or silver; the incitability of the other thigh having been weakened, the limb will remain motionless. By interrupting the chain, however, the muscular movements will be displayed in the latter, and the former will resume a state of repose.

81. The same disposition being made as in the second experiment, and the chain established, if a given point of the muscle be brought in contact with the mercury, without deranging the contact of the nerve; or if a communication be established between the muscle and the mercury, or between the muscle and the zinc, by the means of a metallic substance, the muscular movements will be instantly manifested. These phenomena are occasioned by the fluid accumulated at the point of contact between the nerve and its coating, which fluid returns into the muscle, and there gives rise to the contractions. This is shewn in the following manner:—If, while the communicating metallic substance still touches the muscle and the mercury, or the muscle and the zinc, the latter be detached from the mercury, the contractions will not ensue, as would have happened if the fluid accumulated by the original chain, at the point of contact of the nerve and its coating, had remained there.

82. If the thigh of a frog, prepared in the customary manner, be held in one of the hands, and the nerves, as well as a few points of the muscle, be brought in contact with the mercury, the moment that fluid is touched by a bar of zinc, held in the other hand, previously moistened, violent contractions will be produced in the limb of the animal. This experiment consequently presents phenomena entirely different from those which were the result of the second experiment. The fluid, instead of having been accumulated in the nerve, appears to have flowed out by the muscle, and to have there occasioned the contractions. Such a degree of incitability may be induced, that the contractions may be altogether subdued by the double contact of the nerve and the muscle, as well in forming as in interrupting the chain.

83. If the same disposition having been made as in the sixth experiment, not only the nerve, but likewise the muscle, be made to touch the piece of silver, leaving it, however, in constant contact with the zinc, violent contractions will be manifested as soon as a communication is established between the zinc and the silver, by the means of a conducting substance. By substituting for the silver either copper, plumbago, or lead, the same phenomenon will be obtained.

84. The current which is formed in a chain composed of three metallic substances, is constantly directed towards the extreme metal stationed in front of the metal at the other extremity of the chain. The direction of the current cannot therefore depend, in any degree, on the metal by which the middle space is occupied.

85. In the chain composed of metallic and humid substances, where there are only two or three heterogeneous metals in immediate contact, the current is directed in the same way as it would be if these metals were to be regarded as independent of the rest of the chain.

86. Having placed a thin plate of zinc at the bottom of a vessel filled with water, and brought the tongue in contact with the extremity of a bar of tin, the other extremity of which is made to touch the plate of zinc; if another bar of the same metal, of the same dimensions with the preceding one, be held in one of the hands, and its extremity plunged in the water, there will not be any perceptible savor. In reality, the current is, in this instance, directed in such a way as to pass through the fingers, crossing the body of the person by whom the experiment is made, to accumulate itself on the tongue. But as soon as the second bar of tin is plunged more deeply in the water, so as to touch the zinc, the savor becomes perceptible. This phenomenon, which had not hitherto been noticed, is, according

to M. Lehot, a natural result of the principles he has laid down. By bringing, he observes, the second bar of tin in contact with the zinc, a symmetrical chain is formed, of such a nature, that the fluid it contains must necessarily be in equilibrio. Consequently, the quantity of the fluid which had been accumulated in the preceding disposition, must, unavoidably, have been dispersed, and have occasioned the sensation or flavor which was noticed. On detaching the bar of tin from the plate of zinc, without taking it out of the water, the sensation ceases to be perceptible, on this account, that a current is formed which is directed in such a way as to penetrate the fingers. If the bar of tin be withdrawn from the water, the flavor will be perceptible, in consequence of the dispersion of the accumulated fluid.

87. Thus, to render a chain symmetrical, or to destroy it by the interposition of an insulating substance, will have the same effect relatively to the motion of the galvanic fluid. By the explanation which has just been given, it seems evident that if, after rendering stationary the bar which touches the tongue, and the one which is held in the hand moveable, the operation be performed inversely, the savor will be felt in contrary circumstances; seeing that the current will, in every such case, take an opposite direction.

88. When the extremity of the moveable bar is plunged in water, the one which is held in the moistened hand being fixed, and in contact with the plate of zinc at the bottom of the vessel, the sensation is perceptible on the tongue. But if the former be plunged still deeper, so as to be brought to touch the zinc, the savor will be no longer manifested. On detaching it from the plate of zinc, without, however, withdrawing it from the water, the sensation is again produced; but ceases as soon as the bar is taken out of the water.

89. If the extremity of each of the two bars of tin be laid on a particular point of the tongue, the savor will be felt at the extremity of the moveable bar, the moment its other extremity is plunged in the water, that of the fixed bar being in contact with the plate of zinc. Secondly, by plunging the moveable bar still more deeply in the water, and bringing it in contact with the plate of zinc, the savor will be felt at the point of the tongue where it is touched by the other bar. Thirdly, the instant either of the bars is separated from the plate of zinc, without being, however, taken out of the water, the galvanic savor will be distinguishable at its point. Lastly, the one which was stationary in the first instance, still continuing so, if the moveable one be taken out of the water, the savor will be felt at the extremity of the former.

90. From the principles which have just been laid down, it is not difficult to conclude that, if a metal, taken from the given series, be employed as a bar, and one of those by which it is followed in that series as a communicator plunged in water, the phenomena which take place in the preceding experiments will be entirely changed. Consequently, the cases in which, in the first and second of the above experiments, the sensation was manifested, are precisely those in which there should not be any sensation, under the circumstances above stated, and vice versa. It also follows that, in the third experiment, the cases in which the savor was perceptible at the extremity of the moveable bar, are those in which, under these circumstances, it should be felt at the extremity of the fixed bar, and vice versa; the current then invariably taking a contrary direction.

91. Having placed the nerves of the thigh of a frog on a plate of tin, terminated by a small cavity filled with water, and the muscles on another plate of tin exactly similar, if one of the extremities of an arc of zinc be brought in contact with the bottom of the cavity formed in the coating of the nerve, and if the other extremity of the arc be immersed in the water contained in the cavity of the coating of the muscle, the susceptibility of the organs will be found to be such, that the contractions will not ensue. By plunging the communicator, however, still more deeply in the water, in such a way as that it may touch the bottom of the latter of the above cavities, the contractions will be instantly manifested in the animal arc. Having afterwards detached the arc of zinc from the bottom of the cavity of the coating of the nerve, without, however, withdrawing it from the water, the organ becomes motionless; but, as soon as the arc ceases to be immersed in the water, it being, at the same time, still in contact at its other extremity, the contractions are again produced. This experiment was frequently repeated by our author, and was constantly attended by the same result. In the latter instance, however, the contractions were invariably weaker than in the former.

92. If the arc of zinc be brought in contact with the coating of the muscle, at the same time that its other extremity is plunged in the cavity of the coating of the nerve, the thigh of the frog will be forcibly contracted. By immersing it still deeper, so as that it may reach the bottom of the cavity, the contractions will cease. In detaching it, the muscular movements are usually perceptible; but there are occasions in which the organs remain motionless.

93. The same results will be obtained as often as a more oxydizable metal is employed, to establish a communication between two homogeneous coatings, formed of a weaker metal. If coatings of a metallic substance, possessing a greater capacity, be employed in conjunction with a communicator or arc, which has a less capacity, the effects which will be produced will be diametrically opposite.

94. The experiments which have been thus detailed, lead to a very singular result, namely, that one metal may be distinguished from another without being either directly seen or felt. In reality, by composing a chain in such a way as that it may be terminated by one of the metals described above, a current being formed which takes a particular direction, totally different from the one which it takes when the chain is terminated by another metal, it is easy to recognise any one given metallic substance. In this way M. Lehot was enabled to distinguish a portion of zinc from a piece of silver, at the extremity of metallic threads several yards in length

95 About this period professor Volta took up the subject, and philosophy has to rejoice that his mode of theorizing, although not strictly true, has contributed principally to its rapid advancement. He set out with the idea, contrary to Galvani, that the electricity in question did not belong to the animal, but to the different metals employed. Galvani, therefore, was unlikely to produce any greater effect than what two pieces of metal could effect, because he believed the electricity to be in the animal. Volta was led to the discovery of the battery by combining a number of pieces of metal together, because he was persuaded that the electricity was in the metals and fluids employed.

96. He repeated the experiments of Galvani, and found that when two pieces of metals of different kinds were placed in different parts of an animal at the same time that the metals were brought in contact, or were connected by a metallic arc, as often as the contact was made, convulsions were observed. He found that the greatest effect was produced when the metals were zinc and silver. When several pairs of metals were employed, having pieces of moist cloth between them, the effect appeared to increase as the number of pairs.

97. This important discovery of accumulating the effects of this species of electricity was made by Volta, in 1800, and thence has been denominated the Voltaic pile. The apparatus, as first made by Volta, consisted of a certain number of pairs of zinc and silver plates, separated from each other by pieces of wet cloth. Hence the arrangement was as follows: zinc, silver, wet cloth; zinc, silver, wet cloth, and so on. The silver plates were chiefly silver coins, the plates of zinc and the pieces of cloth being of the same size. He found this pile much more powerful when the pieces of cloth were moistened with a solution of common salt instead of pure water. A pile, consisting of forty pairs of plates, he found to possess the power of giving a very sharp shock, similar to that of a small electric jar; and that this effect took place as often as a communication was made between each end of the pile, and as long as the pieces of cloth remained moist.

98. An account of this discovery was communicated to the Royal Society, and published in the Philosophical Transactions. We do not find that this celebrated philosopher made any considerable discoveries after the invention of the pile.

99. The galvanic pile invented by M. Zamboni, and which he has called a binary pile, is composed only of two elements, namely, a metal and a fluid. The metallic elements of the pile are twenty-nine small squares of tin-foil, about half an inch long on each side, and terminated by a very fine tail, from two to three inches in length; and the fluid element is distilled water, placed in thirty watch glasses, arranged circularly on a table. The water in every two adjoining glasses is connected with one of the elements of tin, by placing the square portion of the tin in one glass, and the tail in the adjoining one in such a manner that the square portion is wholly immersed, while the tail merely touches the fluid. When the metallic elements are all arranged in a similar manner, and when the first and last glasses communicate only by means of all the intermediate ones, it will be found by making a communication between the first glass and the ground, and between the last and a good condenser, that the pile has two poles, one vitreous and the other resinous, the former corresponding to the small squares, and the latter to the long tails.

100. If the pile is constructed with elongated rectangular pieces of tin, no electricity is developed when the two extremities of the rectangles are equally immersed in the distilled water of the watch glasses; but, whenever they are immersed unequally, the electricity exhibits itself at the poles, as in the construction already described; the vitreous pole always corresponding to the larger surface immersed, and the resinous one to the smaller surface, so that the same pole may be rendered alternately vitreous and resinous, by immersing more or less of the nearest ends of the rectangles of tin.

101. When elements of zinc or copper are substituted in place of the tin, the same effects are produced; but no indications of electricity are obtained from oxide of manganese.

102. A pile constructed in the preceding manner does not charge the condenser instantaneously. The electricity does not appear till about the end of half a minute, and often longer, and it then gradually increases. This effect might be ascribed to oxidation, as the pile would then have three elements; but at the end of several days the development of electricity was as powerful as at the moment when the apparatus was arranged, although not the slightest trace of oxidation could be perceived. When zinc was substituted for tin, the electricity diminished as the oxidation increased; it then disappeared and afterwards reappeared, with an opposite character. Hence it would appear that the development of electricity in the binary pile is not owing to the oxidation of the metal.

103. A pile constructed with ten discs of tinned paper, without any other substance, produced, in about half a minute, a deviation of a third of an inch in Bennet's electrometer, furnished with a condenser. The tinned face possessed vitreous, and the paper face resinous, electricity. This effect invariably increased with the number of the discs.

104. Another pile of discs of tinned paper, having the paper face covered with a film of honey, in order to keep up a constant humidity, likewise gave signs of electricity, but it required from forty to fifty discs to produce the same degree of electricity as the preceding pile of ten discs of tinned paper; and the electricity was besides of an opposite character, the honey being vitreously, and the tin resinously, electrified. On the following day the electricity had rapidly diminished, and at last it completely disappeared, the paper having been penetrated throughout with the honey, and the tin being equally in contact by its two surfaces with the latter substance.

105. A pile of discs of tinned paper, in which all the discs had been glued together, gave no electrical indications, because the metal was equally in contact with the paper at each of its faces.

106. When a binary pile, like any of the preceding, has become inactive, its energy may be restored, by simply raising the discs, which, by the action of the air, will diminish the influence of humidity upon one of the faces of each disc. The binary piles, indeed, do not produce any effect, unless the touching surfaces of the metallic and the fluid element are unequal.

107. The energy of the binary piles is much influenced by the conducting power of the fluid which forms the humid element. A few drops of a solution of sal ammoniac added to the distilled water, augments a little the electricity of the pile; but if we continue to add more, a diminution of action takes place, and at last the energy of the pile is destroyed. Hence it follows, that the humid element must be an imperfect conductor.

108. Mr. Singer, in his first experiments, cut a number of thin slips of sheet copper, and bent them into the form of the letter U, so as to form a series of simple springs. He then introduced both legs of one of these springs into each cell of a Voltaic battery, so that it pressed forcibly against the copper surface on one side of the cell, and the zinc surface on the other. Having, in this manner, made a regular metallic communication between every pair of plates in a battery containing fifty of three inches square, Mr. Singer filled the cells with a diluted acid, and found that, notwithstanding the total absence of insulation, water was decomposed with great rapidity, a vivid spark produced by charcoal points, and gunpowder inflamed; and, on applying the condenser, a charge was communicated which occasioned the gold leaves of the electrometer to strike the sides of the glass.

109. This phenomenon appears the more extraordinary at first view, because it is well known that, if the plates are all connected together by a thin wire, the effect is almost totally destroyed; but in such case, the opposite copper and zinc surfaces of each pair of plates are made to communicate with each other, and consequently their electricities circulate individually, instead of being propelled forward from one cell to the other. But, in the arrangement above described, the metallic springs are in contact with the zinc surface of one pair of plates, and the copper surface of another; there is consequently no communication between the opposite surfaces of any individual pair, but what arises from the association of the copper and zinc; and, as their mutual contact produces a motion of the electric fluid from the copper to the zinc, it cannot operate as a conductor in the contrary direction. The effect is therefore only diminished in proportion as the copper spring, by placing part of the zinc plate between two copper surfaces, diminishes its electro-motive energy. This experiment appears a satisfactory proof of the electro-motive power produced by the association of the metals, and of its tendency to produce a current of electricity from one extremity of the battery to the other, and consequently a circulation of electric fluid when the opposite extremities are connected: it also proves that the electro-motive power is influenced by the nature of the substance interposed between the different pairs of metals, and thus accounts in some measure for the different effect produced by different fluids. This last circumstance is an interesting subject of enquiry; some instructive facts respecting it have been detailed by professor Berzelius, in an account of an ingenious experiment made to prove that oxidation is not the cause of the electricity of the Voltaic apparatus. The following is extracted from his description. 'I took twelve tubes of glass, half an inch diameter and three inches in height, and closed at one end. I half filled them with a strong solution of submuriate of lime (such as is obtained from the residue after the preparation of caustic ammonia), and above this fluid I poured diluted nitric acid, with the precaution not to mix the liquids. I arranged these tubes in succession, and then took copper wires, round one of the extremities of each of which I had melted zinc, in order to attach a knob of that metal to that end. I immersed the zinc-coated ends of each into one of the tubes to the bottom of the submuriate, and then bent the upper ends of the respective wires so as to immerse them in the middle of the acid of each nearest tube. This arrangment consequently formed a series in the order following: copper, zinc, submuriate of lime, nitric acid; copper, zinc, &c. It is evident that the chemical affinity which produces oxidation at the common temperature, was here at the surface of that part of the copper which was in contact with the nitric acid; and that, if this oxidation had been the primary cause of the electricity of the apparatus, the pole of copper in this construction, ought to have possessed the same electricity (namely, the positive) as the zinc pole in the common pile. Before the extremities of this small apparatus were connected, the copper continued to be constantly dissolved in the acid, which it turned blue, and the surface of the zinc remained metallic and without any perceptible change. And lastly, I combined the poles, by means of silver wires, passed into a tube filled with a solution of muriate of soda. But I was greatly surprised to find the effect directly contrary to what the theory, which considers oxidation as the cause of the electricity of the pile, had led me to expect. The solution of the copper instantly ceased, and the zinc became covered with a mass of white oxide, vegetating on all sides in the form of wool. The pole of the copper produced hydrogen gas as usual, and the zinc pole caused an abundant precipitate of muriate of silver. The electric state, therefore, produced in this case an affinity, which at the ordinary temperature of the atmosphere is inactive, and caused another very active affinity to cease, which was already in operation; and this could be effected by no other cause than that of the electricity produced by contact, which occasions the electric charge of the pile, and disposes the affinities which shall be put into activity. This little apparatus was very powerful, and disengaged so large a quantity of gas, as would not have been exceeded by 100 pairs of plates. But what could be the cause of this? I exchanged the submuriate for neutral muriate; it then produced a very moderate effect, corresponding with the number of pairs; and, lastly, I substituted neutral muriate

of zinc instead of the muriate of lime, and then the effect was scarcely perceptible, though it continued sufficient to prevent the oxidation of the copper in the nitric acid, and to show that the conductor of the zinc pole continued always to be oxidized.' This experiment demonstrates the influence of the interposed fluid on the chemical effects of the apparatus, which may probably arise from its action on the electro-motive power produced by the association of the metals. It indicates also, that the chemical action of the battery is never exerted but when the electric fluid circulates from one extremity to the other; and corresponds in this respect with an experiment by Sir H. Davy, in which forty compound arcs of zinc and silver were arranged in the usual order, in a series of glasses, filled with a solution of muriate of ammonia rendered slightly acid by muriatic acid; whilst the extreme parts remained unconnected, no gas was disengaged from the silver, and the zinc was scarcely acted upon; but when they were connected all the zinc wires were dissolved more rapidly, and hydrogen was disengaged from every silver wire. In simple Voltaic combinations, it appears essential to the production of chemical effects, that there be a transition of the elements of the interposed fluid; and, as this may be presumed to take place also in each cell of a battery, it is perhaps one cause of the superior action of those fluids which are most readily susceptible of decomposition. When for instance a compound arc of zinc and platina is placed with the platina leg in a solution of silver, and the zinc leg in dilute muriatic acid, no precipitation of silver takes place unless the glasses are connected by some fluid medium, or by a metal which is soluble in the acid of the solution of silver. With arcs of platina, or gold, therefore, no effect is produced; but, with any other metal, a portion of the silver or copper of the solution is revived, and a corresponding portion of the simple connecting arc is dissolved, and occupies the place of the revived metal in the solution. Hence the corrosion of the zinc plates in the Voltaic battery, and the liberation of hydrogen at the copper surfaces. From the phenomena hitherto described, it appears that the primary source of the electric power of the Voltaic apparatus may be considered to be the association of the metals of which it is composed; but the chemical effects, though probably arising from the same cause, are obviously influenced by the nature and action of the interposed fluid. The relation of the various parts of a Voltaic apparatus (as usually constructed), to the various effects it produces, have been developed by the masterly experiments of M. De Luc. The ordinary apparatus consists of three constituent parts, namely, two metals and a fluid, being usually, when arranged in a pile, copper or silver, zinc, and wet cloth, following each other in successive groups. Now, if these be regarded attentively, without any regard to Volta's theory, they may be considered as divided into ternary groups under three different aspects. 1. Zinc and silver, with wet cloth between them. 2. Zinc and silver in mutual contact, with wet cloth on the side of the zinc. 3. Zinc and silver still in mutual contact, but the wet cloth on the side of the silver. Either of these ternary associations may be the cause of the action of the apparatus; but the really efficient groups may be ascertained, if each of the ternary associations are successively mounted as a pile, the different groups being separated from each other by some conductor that does not materially affect their electro-motive power. M. De Luc employed for this purpose small tripods, formed of brass wire, so bent as to touch the plates between which the tripod was placed, only at the three points of support.

110. The first dissection of the pile by this method was to form an arrangement of seventy-six groups of zinc and silver with wetted cloth between them; one group being placed first (suppose with the zinc plate lowest); then upon the silver plate a tripod of brass wire; upon that another group with the zinc plate lowest; again, upon its silver, a tripod, upon that a third group in the same order, and so on until the whole seventy-six groups were arranged.

111. Under these circumstances the same chemical and electrical effects were obtained, as when the apparatus was put together without the brass tripods. It therefore appeared that the efficient groups, for all the effects of the apparatus, were an association of silver and zinc, with wetted cloth between them. To ascertain the truth of this indication, a second dissection was made. In this the two metals were placed in contact with each other, and the wet cloth in contact only with the zinc plate. Suppose a pair of zinc and silver plates in contact with each other, placed on the base of the pile with the silver lowest, then a disk of wetted cloth upon the zinc, and a tripod upon the wetted cloth; then another group of zinc and silver, with wet cloth upon the zinc; then again a tripod, and so on, in regular order, until the seventy-six groups were arranged.

112. With this apparatus the electrical effects were produced as before; but, though these ceased when the usual glass tube for decomposing water was made to connect the opposite poles, not the slightest chemical effect was produced.

113. From this it appears, that the condition for the production of chemical and electrical effects is different; the latter requiring the arrangement of silver and zinc in mutual contact, the successive pairs being separated by a moist conductor, which may be in actual contact with the zinc only; the former requiring the association of silver and zinc, with wetted cloth between them.

114. A third dissection of the pile was thus arranged: silver and zinc in mutual contact, wetted cloth in contact with silver: seventy-six of these groups were placed in regular order, with a tripod upon the wet cloth of each group, as in the former experiment. With this arrangement neither chemical nor electrical effects were produced; the absence of electrical signs M. De Luc ascribed to the zinc plates being in contact on one side with the silver, and on the other with the brass of the tripod, which he regarded as a counteracting effect. The absence of chemical signs arose from the want of the condition for

their production, namely, successive associations of zinc and silver, with a fluid between them and in contact with both.

115. When either the continuous pile, or that composed of the efficient ternary groups, are put together with the pieces of cloth moistened with pure water, although chemical effects are produced, no perceptible shock can be felt; but, when the pieces of cloth are moistened by a solution of common salt, the shock is very distinct. Hence M. De Luc concludes, that for the production of chemical effects in the circuit it is essential that the zinc undergo oxidation, and for the production of the shock it is necessary that oxidation be effected by the action of an acid.

116. M. De Luc conceived the phenomena of the pile might arise from some modification of the electric fluid which pervaded it during the oxidation of the zinc; and as, in his experiments, he obtained more perceptible electrical indications by aid of the condenser, from wires immersed in water, when the chemical effects and the shock were produced, he concluded that this modification of the electric fluid was attended by a retardation of its course, by which a very small quantity was enabled to produce effects which are not obtained by a much larger quantity when set in motion by the electrical machine.

117. This idea, it may be observed, is the very converse of that which, from a very general and extended view of the phenomena of the Voltaic apparatus, Mr. Singer proposed.

It was indeed a natural inference at first view, from the experiment in question, when that alone was considered; but the increased rapidity of decomposition, which always attends the increased operation of that influence, which is here supposed to cause a retardation of the current that occasions decomposition, is very inimical to any such supposition; and the usual phenomena of electrical analysis are equally at variance with it.

118. When any fluid is decomposed by the action of the common electrical apparatus, the effect is always proportioned to the intensity of the current of electricity that passes through it; and in the decomposition of water, when the metallic surface in contact with it is of moderate extent, very strong shocks in rapid succession are required. It is to the acute intelligence of Dr. Wollaston we are indebted for the means of executing this analysis with a more moderate power. He enclosed the metallic conductor in glass, or wax, and exposed only a very small portion of its surface to the fluid. The current of electricity, being thus reduced in volume, was proportionably increased in force; and, by rendering the exposed surface very minute, a sufficient intensity was produced, by a moderate quantity of electricity.

119. When a circuit is made through water, by wires proceeding from the opposite extremities of a Voltaic battery, those wires can impart no charge to the condenser, unless the quantity of electricity evolved by the battery is greater than the water can transmit: therefore any cause that increases the quantity, will produce an augmentation of effect by this test, whilst the column of water remains the same; or if the velocity of the electro-motion of the apparatus be increased, whilst the same imperfect conductor is interposed between its extremities, a similar effect must take place; for the positive wire will receive electricity from the pile faster than it can transmit it to the water, and the negative wire yields electricity to the pile more rapidly than it can receive it from the water; so that a slight positive and negative charge will be given to the condenser by these wires respectively, whenever the electro-motion of the pile supplies electricity faster than the water can conduct it; and the charge will be highest when the supply is most rapid. Now, according to Mr. Singer's principle, the most rapid electro-motion of the apparatus will be produced when the different pairs of plates communicate with each other through the medium of the best conducting fluids: it is therefore obvious, that the result of M. De Luc's experiments, in which a more considerable charge was communicated to the condenser by wires immersed in water, when the pile was excited by a saline solution, than when it was excited by pure water, is conformable to the above principle; and the legitimacy of this inference is confirmed by a variation of the experiments; for if, when the apparatus is excited by a saline fluid, the tube that connects its extremities be filled with the same fluid instead of pure water, no increased charge will be given to the condenser by either of the wires, because the increased electro-motion of the apparatus is then compensated by the increased conducting power of the fluid by which its extremities are connected.

120. When different degrees of chemical action are excited in the Voltaic apparatus, by the introduction of various fluids, the more powerful the action that is produced the more transient is its duration. This circumstance is of importance in the practical application of the instrument, since it offers the means of judiciously applying various methods of experiments, and of continuing the action of the apparatus during any required time. When the battery is charged with water, its chemical action is feeble, but it appears to continue without diminution for any indefinite length of time; by the addition of a minute quantity of muriatic acid, $\frac{1}{300}$th part for instance, its chemical action is greatly augmented, and still continues for a considerable period. When the proportion of acid is increased to a thirtieth or twentieth part, the action is considerable, but comparatively of short duration. Mr. Singer says, he has found no solutions so advantageous as those of acids, and he prefers the muriatic acid to all others; the nitric is indeed rather more powerful in the same proportion, but its cost is four times as great, and it is found that it destroys the copper plates as well as the zinc. The nitrous gas evolved by its action is also much more offensive than hydrogen, which results from the employment of muriatic acid.

121. The experiments of M. De Luc induced him to conclude, with Volta, that the electrical effects of the apparatus result entirely from the successive association of the different metals,

separated into pairs by some conducting substance that does not interfere with their electromotive powers. To ascertain if a liquid was essential to this effect, he mounted a pile with pieces of cloth not moistened, and he found the electric effects were still produced, but somewhat weaker than with the wetted cloth. He then instituted a series of experiments, successively mounting the pile with different animal and vegetable substances, interposed between the pairs of metal, instead of wetted cloth. Of the various substances tried, he preferred writing paper, as the most convenient of those that were efficient. The apparatus constructed in this way was found to have the same electrical indications as the common Voltaic pile, but it produced no chemical effects, however numerous the pairs of plates; nor was any oxidation of the zinc produced by its most protracted action. These circumstances led to the idea, that, by the extension of the number of groups, a kind of perpetual electric machine might be formed; and, as in the previous trials, it had been found that the effect was rather increased by pasting the paper upon the silver or copper. Dutch gilt paper, which consists of thin copper leaf, laid upon paper, was employed instead of the usual silver, or copper plates, and moist conductors: 800 plates of tinned iron being put together with the same number of Dutch gilt paper between them, the copper sides being all turned in one direction, the combination was found to affect the electrometer more powerfully than any Voltaic battery had been ever observed to do; but on the application of the usual glass tube with water, no chemical effect was noticed. The apparatus was left for a considerable time, and its action on the electrometer continued without diminution; and subsequent experience has shown that it does so for any period during which the experiment has been continued. Thus was invented a new and important Voltaic arrangement, highly valuable both in a theoretical and practical view: in the former, as separating the pure electrical effects of the Voltaic battery from its chemical power, and demonstrating the permanence of its electro-motive faculty: in the latter, as providing a spontaneous and permanent electrical machine, in which the opposite electrical states perpetually exist, without any new excitement. Besides these properties, the new apparatus promises to become an important meteorological instrument; for the degrees of its electrical indications have been observed to vary with the different seasons of the year, and are probably influenced by some of the causes by which our atmospherical phenomena are produced.

122. To distinguish this instrument from the usual Voltaic apparatus, from which it differs in many respects, M. De Luc proposed to call it 'the Electric Column,' an appellation sufficiently appropriate, since the effects it produces are purely electrical.

123. Mr. Singer made very numerous experiments, on the constructions of such columns, and varied their combinations most extensively. The materials he preferred, are thin plates of flatted zinc alternated with writing or smooth cartridge paper, and silver leaf. The silver leaf is first laid on paper, so as to form silvered paper, which is afterwards cut into small round plates by means of a hollow punch. In the same way an equal number of plates are cut from thin flatted zinc, and from common writing or cartridge paper. These plates are then arranged in the order of zinc, paper, silvered paper with the silvered side upwards; zinc upon this silver, then paper, and again silvered paper, with the silver side upwards; and so on, the silver being in contact with zinc throughout, and each pair of zinc and silver plates separated by two discs of paper from the next pair. An extensive arrangement of this kind may be placed between three thin glass rods, covered with sealing-wax, and secured in a triangle, by being cemented at each end into three equi-distant holes in a round piece of wood; or the plates may be introduced into a glass tube previously well dried, and having its ends covered with sealing-wax, and capped with brass; one of the brass caps may be cemented on before the plates are introduced into the tube, and the other afterwards; each cap should have a screw pass through its centre, which terminates in a hook outside. This screw serves to press the plates closer together, and to secure a perfect metallic contact with the extremities of the column. To fill the tube with discs, it is necessary to employ a cylindrical rammer of baked wood with flat ends, and when a small number (as about half a dozen discs) are introduced, they should be thrust down, taking care to ensure their perfect contact; and the operation of the apparatus will be ensured.

124. Soon after the invention of the column, Mr. B. M. Forster discovered that, when a sufficiently extensive series was put together, its electric power was sufficient to produce a sort of chime by the motion of a small brass ball between two bells, insulated, and connected with the opposite extremities of the column. He constructed a series of 1500 groups, and by its agency kept a little bell-ringing apparatus in constant activity for a considerable length of time.

125. Mr. Singer contrived an arrangement which is well calculated to form a perpetual motion, by excluding, to a very considerable extent, the operation of extraneous causes of interruption, and it at the same time renders the disposition of the apparatus rather elegant. A series of from 1200 to 1600 groups are arranged in two columns of equal length, which are separately insulated in a vertical position by glass pillars constructed on his principle of insulation; the positive end of one column is placed lowest, and the negative end of the other; and, their upper extremities being connected by a wire, they may be considered as one continuous column. A small bell is situated between each extremity of the column, and its insulating support, and a brass ball is suspended by a thin thread of raw silk, so as to hang midway between the bells, and at a very small distance from each of them. For this purpose the bells are connected, during the adjustment of the pendulum, by a wire, that their attraction may not interfere with it; and, when this wire is removed, the motion of the pendu-

lumn commences. The whole apparatus is placed upon a circular mahogany base, in which a groove is turned to receive the lower edge of a glass shade with which the whole is covered.

126. If a column of about 1000 series is placed horizontally, with each of its extremities resting on a gold leaf electrometer, the electrometers will each diverge; that connected with the zinc extremity of the column will be positive, that connected with the silver extremity will be negative. If the column be very powerful, the gold leaves of the electrometer will alternately strike the sides of the glass, but this motion is soon stopped by their adhering to it. If the simple divergence only is produced, on touching either extremity of the column, the electrometer connected with it closes, and that at the opposite extremity has its divergence increased. This is analogous to the effect of the Voltaic battery when disposed in a similar manner; but the motion in the column is slower, which arises from the more imperfect conductors of which it is composed.

127. There is some cause, not yet perfectly developed, that appears to influence the power of the column to produce the motion of light metallic pendula. In the bell-ringing apparatus, for instance, though the motion always continues, it is much more rapid at one period than another, and the oscillations of the pendulum, though usually as uniform as that produced by mechanism, is on some occasions singularly wild and irregular. The frequency with which the gold leaves of an electrometer strike the sides of the glass, when connected with an electric column, is also different at different times; the variations observed in some experiments of M. De Luc are much more considerable than we have yet noticed, with the more powerful columns of Mr. Singer's construction.

128. De Luc proposed, as an interesting object of enquiry, to make regular observations on the action of the column, and the number of oscillations it would produce in a given time, at each observation. For this purpose a single column of from 1000 to 2000 series may be supported vertically on an insulating pillar. A bent wire, with a ball at its lower end, is to be connected with the upper extremity of the column, so as to hang parallel with, and at some distance from it; the ball at its lower extremity being diametrically opposite to a similar ball that is screwed into the lower cap of the column. To the same cap there is also screwed a brass fork with a fine silver wire stretched between its extremities; this is placed above the ball and projects farther from the column, so that when the pendulum moves towards the ball it strikes this wire first, and receives a kind of jerk, which prevents it from sticking. The pendulum consists of a gilt pith-ball suspended by a very fine silver wire, which hangs parallel to the bent brass wire, to which it is fastened at top; the arrangement is such, that the gilt pith-ball would be always in contact with the brass ball that proceeds from the upper extremity of the column, if the apparatus had no electrical power; it therefore always returns to this situation, when, after being attracted to the lower extremity of the column, it discharges its electricity by striking against the cross silver wire.

129. There appears every reason to believe, that the action of a well-constructed column would be permanent. There is, however, a precaution necessary to their constant and immediate action; the two ends of a column should never be connected by a conducting substance for any length of time; for if, after such continued communication, it be applied to an electrometer, it will scarcely affect it for some time. It is, therefore, necessary, when a column is laid by, that it be placed upon two sticks of sealing-wax so as to keep its brass caps at the distance of about half an inch from the table, or other conducting surface on which it is laid. And if a column, which appears to have lost its action by laying by, be insulated in this way for a few days, it will usually recover its full power.

130. There is another cause of deterioration which is more fatal; it is the presence of too much moisture. If the paper be perfectly dry it is a non-conductor, and will not therefore produce any action in the column; but this perfect dryness can only be obtained by exposing the paper to a heat nearly sufficient to scorch it, and in its dryest natural state the paper will be found sufficiently a conductor, even when, by exposing the paper discs to the heat of the sun, they have been so dried as to warp considerably. When the paper is sufficiently dry, the action of the column continues without diminution; and on taking such an apparatus to pieces after it had been constructed thirty months, no trace of oxidation was evident on the zinc plates.

131. The size of the plates in the column need not be large; Mr. Singer has constructed them of various sizes, and finds no proportionate advantage by extending the diameter beyond five-eighths of an inch; they may even be constructed much smaller, and yet found to act with the greatest precision.

132. By connecting the extremities of a column of at least 1000 series, with the opposite coatings of a Leyden jar, during a period of from one to five minutes, a charge is usually communicated to it capable of affording a small but distinct spark, when the discharge is made by a wire that is not very thick.

133. Mr. Singer observes that the most extensive series he had ever made experiments with, consisted of 20,000 groups of silver, zinc, and double discs of writing paper. Its power was considerable. Pith-ball electrometers, with balls of one-fifth of an inch diameter, and threads of four inches long, diverged to the distance of two inches and upwards, when connected with its opposite extremities. An electrometer in the centre was not affected. When either extremity of the column was connected with the ground, the electrometer attached to that extremity closed, and the central electrometer opened with the same electricity, whilst that connected with the opposite extremity had its original divergence considerably increased; but the electro-motion was so slow, that some minutes were required to produce the full effect.

134. By connecting one extremity of the series with a fine iron wire, and bringing the end of

this near the other extremity, a slight layer of varnish being interposed, a series of minute bright sparks were obtained by drawing the point of the iron wire lightly over the varnished surface.

135. A jar containing fifty square inches of coated surface was charged by ten minutes contact with the column, so as to convey a disagreeable shock, felt distinctly in the elbows and shoulders, and by some individuals across the breast.

136. The charge from this jar could perforate thick drawing paper, but not a card. It had just power to fuse one inch of platina wire, of the $\frac{1}{5000}$th of an inch diameter.

137. Notwithstanding the considerable electric power of this combination, it had not the slightest chemical action; neither the best nor worst conducting media were affected. Saline compounds, tinged with the most delicate vegetable colors, were exposed under the most favorable circumstances to its action, and in some instances for many days, but no chemical effect was produced.

138. It therefore appears indispensably necessary to the chemical power of the Voltaic apparatus, that a liquid be interposed between each pair of its plates, whilst, for the pure electrical effects, the only condition appears to be the association of the two metals, and the connexion of the different pairs, by some conductor that does not interfere with their electro-motive power.

138*. The first experiments made upon the moist pile in this country appear to have been performed by Messrs. Nicholson and Carlisle. After observing the effects then ascribed to the piles on bringing the wires from each end of the column in contact with a drop of water, they observed a disengagement of bubbles of some elastic fluid.

139. On closer examination they found the gas to be hydrogen. They then took a glass tube, about half an inch in diameter, into each end of which a cork was inserted, the tube being filled with water. Through each cork was introduced a brass wire, so that the ends of the wires in the glass were about an inch and three-quarters of an inch. The pile employed consisted of thirty-six half-crowns, and as many similar pieces of zinc, and wet pasteboard. The zinc end of the pile was then connected with one of the wires in the tube, and the silver end with the other, so that the circuit formed by the pile was separated by the water in the tube placed between them. A stream of bubbles was observed at the end of the wire, in the tube connected with the silver end of the pile. No gas was disengaged from the opposite wire, but it speedily became tarnished, first of an orange color, and ultimately black. The tube was then reversed, when it was observed that the wire, which in the first experiment became tarnished, gave out bubbles, while that which had before given out gas, in its turn became tarnished.

140. The emission of gas from the wire connected with the silver end of the pile was constant and uniform, except when a metallic circuit was formed between the ends of the pile, during which no gas whatever appeared. It was observed that, when this metallic conductor was removed, the appearance of the gas was not immediate, since there was an interval of about two seconds between the removal of the wire and the appearance of bubbles. After the process had continued two hours and a half, a bulk of gas was produced equal to two-thirds of a cubic inch. This gas was mixed with an equal bulk of common air, and exploded on the application of a lighted taper.

141. These ingenious experimenters, supposing the phenomena in question to arise from the decomposition of the water, thought it surprising that the hydrogen should make its appearance at a distance of an inch and three-quarters from the point where the oxygen was disposed of.

142. They then made the same experiment with a tube thirty-six inches in length, but no gas was observed. When they introduced an infusion of litmus instead of pure water, they observed that the fluid in the vicinity of the wire connected with the zinc end of the pile became red, and hence were led to suppose that an acid had been produced. The fluid at the other wire was not changed, but gas, as usual, was evolved.

143. It may be proper to state that, in every apparatus constructed for practical purposes, there is a combination of three different substances in contact with each other, in successive groups; in general it is an arrangement of copper, zinc, and some conducting fluid. It is demonstrable that the primary source of the electrical power of the apparatus is the association of the two metals; and, according to Volta, the interposed fluid serves only as a conductor of the effect of one pair of metals to another. As far as electricity is concerned, this opinion appears to be correct, for the electrometer is acted on, whatever be the nature of the interposed fluid, and the degree of divergence is proportioned to the number of the plates. The electrometrical effects prove also, that, the arrangement of a series of zinc and copper plates, with an interposed fluid, forms a conducting column, which, in its insulated state, is positive at one extremity, negative at the other, and neutral in the middle. This may be easily shown by three gold-leaf electrometers, connected at the same time with an apparatus of 300 or 400 pairs of plates. The electrometer, connected with the copper extremity, will diverge with negative electricity; that connected with the zinc end will separate to the same distance positively; while that connected with the central plate of the series will not be affected. But, if either extremity of the battery be connected with the ground by means of a wire, the leaves of the electrometer connected with it will close; and those of the central electrometer will open with the same electricity, and to the same extent, whilst those of the opposite extremity will have their original divergence increased.

144. Hence it appears that there is a real electro-motive property in the apparatus, by which the zinc end constantly tends to become positive, and the copper end negative; and it is also obvious, that the extent of this operation,

at either extremity, is increased by connecting the opposite end with the ground. This last experiment, by which the central plate may be rendered either positive, negative, or neutral, at pleasure, proves also that the interposed fluid never acts as an insulator, for if it did so these changes could not possibly occur.

145. As the contact of either surface of the battery with the ground increases the electrical state of the opposite extremity, the same circumstance may be presumed to take place with every pair of associated metals, when their surfaces are in contact with a conducting fluid. Whilst the apparatus is insulated, the first zinc plate can only act on the electricity of its associate, the first copper plate; but the second zinc plate, through the conducting interposed fluid, can act on both these, besides its companion, the copper, and may therefore become more highly positive; and it is easy to conceive that such a repetition of action would be attended with an increase of effect, proportioned to the number of plates; and that the electrical tension of either end must be increased by connecting the other with the ground.

146. To ascertain if this principle really operated with a single combination, Mr. Singer took a pair of circular plates six inches diameter, very clean and smooth, one being formed of zinc and the other of copper, and each provided with an insulating handle. When both plates were held by their insulating handles, and the zinc was successively applied to the flat surface of the copper, and after each contact made to touch the insulated plate of a condenser of six inches diameter; twenty contacts were required to communicate such a charge to the condenser as would occasion the leaves of a very delicate electrometer to separate to a quarter of an inch. But when the copper plate, instead of being held by its insulating handle, was simply laid on the hand, or on any similar conducting body, ten successive contacts of the insulated zinc plate, communicated a charge to the condenser, which occasioned the gold leaves to separate to the distance of more than half an inch. On repeating these experiments, with the variation of touching the condenser with the copper plate, held by its insulating handle, and brought in contact with the zinc plate, first insulated, and then uninsulated, similar results were obtained, but with the contrary electrical state. Hence the similarity of action in a single pair of metals, and a combined series, is sufficiently proved; and the preceding statement of the manner in which the electrical power is supposed to increase with the number of associated plates, is rendered highly probable.

147. So far the phenomena are sufficiently simple and consistent, for those described are not materially influenced by the nature of the interposed fluid, nor do they occur, but when the extremities of the apparatus are unconnected with each other, and consequently capable of maintaining the opposite electrical states. But the chemical effects, the shock, and the power of ignition, take place only when the extremities of the apparatus are connected by some conductor, and are also materially influenced by the nature of the interposed fluid. If these effects then, are produced by electricity, they can only result from its circulation in the apparatus; and, as there is no reason to suppose that the electro-motive power of the associated metals ceases when there is a conducting communication between their opposite surfaces, but rather that it is accelerated by such a circumstance; that very acceleration may be the cause of the phenomena, and the effects observed correspond very nearly with such an idea; for, if it be admitted that the connexion of the opposite ends of the Voltaic battery by a conductor, occasions a current of electricity from the positive to the negative, that current must be more rapid, in proportion as the conductor is more perfect. Now it is found that the chemical effects are most considerable, and more promptly produced in fluids of the highest conducting power; thus the quantity of gas liberated in a given time from common water, is greater than from distilled water; saline fluids furnish more than common water; solutions of alkali more than saline fluids, and acids more than alkalies: and, as the effects of a simple combination are influenced by the same causes as those that operate with a series, the fluids that are susceptible of the most rapid decomposition are also most active in exciting the chemical effects of the battery, when employed as the connecting medium between its plates.

148. Acids are of all other fluid bodies, excepting metals, the most perfect conductors, and the chemical effect of the battery is more powerfully excited by them than by any other substances; it is possible that their chemical action on the zinc may have some share in modifying the quantity of electricity, or the rapidity of its motion; but it is certain that the effects are not in proportion to the chemical action; sulphuric acid, for instance, acts as powerfully on the zinc as nitric or muriatic acid, but it is not so active in producing the chemical agency of the battery: in like manner the alkalies, which exert a very trifling action on the battery, excite its powers with greater energy than many saline fluids which are more efficient as chemical agents.

149. The ignition of wire, and of charcoal in the Voltaic circuit, is conformable to this view; these substances are the most perfect conductors known, and, when made the medium of communication between the opposite ends of a battery, must accelerate its electro-motive power to the greatest extent. The rapid circulation of electricity, thus obtained, produces ignition, if the conductor be not too large in proportion to the quantity of electricity; but, within this limit, the effect will be greatest with the thickest wire, because the acceleration will be more considerable in proportion to the facility of transmission. There is, perhaps, no other view on which the continued ignition of wire, and the increased action of large plates is so intelligible.

150. The cessation of chemical agency, and igniting power, as the chemical action of the acids or other menstrua declines, may arise from the total change which then occurs in the nature of those fluids; their conducting power is much diminished, and they may possibly, by the change

in their chemical properties, acquire some faculty of electro-motion subversive of the effect of the combined metals.

151. The extensive experiments of Messrs. Hisinger and Berzelius, confirmed by the researches of Sir H. Davy, had demonstrated the constant separation of oxygen, and compounds in which it prevailed, at the wire proceeding from the zinc surface, and of hydrogen and other inflammable matter, at that connected with the copper surface; and, at this latter, alkali was also frequently found, and, from analogy, it was in consequence concluded, that the alkalies probably contained a considerable proportion of some inflammable substance.

152. This conjecture was confirmed by Sir H. Davy in 1807: he found that a thin piece of potassa or soda, slightly moistened by exposure to the air, and placed between two conductors of platina, proceeding from the opposite sides of a powerful Voltaic apparatus, was resolved into a peculiar metallic substance highly inflammable, which appeared at the negative surface; and oxygen gas, which was evolved at the positive surface. By an extensive series of experiments, it was shown that these bodies are, in reality, metallic oxides, and that the proportion of their constituent parts is somewhat different, being in round numbers, for potassa six parts of metallic base to one part of oxygen, nearly; or it may be stated that potassa is composed of eighty-six parts of metal, and fourteen of oxygen in each 100 parts. The proportions in soda are nearly seven parts metal to two of oxygen; or seventy-eight metal and twenty-two oxygen, in each 100.

153. The metal obtained from potassa is called potassium; it is lighter than water in the proportion of eight to ten. At common temperatures it is solid, but soft and plastic. At a temperature of 150° it becomes fluid, and evaporates at a heat rather below redness. In color it nearly resembles silver, but it tarnishes immediately when exposed in the open air, and can only be preserved under naphtha. Its attraction for oxygen is so powerful, that it will detach that substance from almost all its combinations; and the result of this action is its consequent oxidation and reconversion into potassa. If thrown into water it immediately inflames, floats upon the surface, and burns with a mixed flame of white, red, and violet; rendering the water, in which the experiment is made, alkaline. Similar phenomena ensue when it is brought in contact with ice. When moderately heated in oxygen gas it inflames and reproduces potassa. Its action on water is always attended by the decomposition of that fluid; hydrogen is evolved, and the oxygen combines with the potassium to form potassa. By measuring the quantity of hydrogen separated from water, by the action of a given weight of potassium, the quantity of oxygen that metal combines with to form potassa may be readily learnt. Each grain of potassium detaches about 1·06 cubic inch of hydrogen gas, and consequently combines with half that quantity of oxygen.

154. The metal obtained from soda is named sodium; it is rather lighter than water, nearly as 0·9348 to 1000. It has the color of silver; is less fusible than potassium, but tarnishes in air in the same way. It is fluid at the temperature of 200°, and passes into vapor at a strong red heat. At common temperatures it is a soft metal, and a globule of it may be easily spread into a thin leaf by the action of a knife. It decomposes water violently, and floats on its surface, but does not inflame; the water is rendered alkaline, and, when examined, is found to contain pure soda. It acts nearly in the same manner as potassium, but with less energy, on most substances, and must consequently be preserved under naphtha. When thrown on the surface of nitric acid it inflames, and burns with great brilliance; it also occasionally scintillates when thrown upon hot water. The proportion of oxygen with which it combines to form soda, may be learnt by noting the quantity of hydrogen evolved from water by a given weight of the sodium.

155. Both these new metallic substances unite with mercury in various proportions, and form amalgams which decompose water, but more slowly than the metals themselves; these amalgams act upon all other metals, even platina and mercury.

156. The decomposition of the alkalies may, by care and attention, be effected with a battery of fifty pairs of plates of three or four inches square; but the results are rather uncertain: 200 plates form a very efficient arrangement; they should be excited by a weak acid mixture (about one part strong muriatic or nitrous acid, to thirty parts of water). A plate of silver or platina being connected with the negative side of the battery, a thin piece of pure potassa or soda is to be placed upon it, and a platina or silver conductor, proceeding from the positive side of the battery, is to be brought in contact with the upper surface of the alkali, which soon fuses at the points of contact: metallic globules shortly appear near the negative surface, and gradually increase in size, until a crust of alkali begins to form on their surface; at this moment they should be removed by the point of a knife, and instantly plunged under naphtha; or, if the experiment be merely intended to demonstrate their production, they may be brought in contact with the surface of water or nitric acid. It sometimes happens that no globules appear; but if the contact be preserved for some time, and the alkali be afterwards raised, several will be found imbedded in its under surface. If the action of the battery be strong, it also sometimes happens that the globules inflame, and even detonate at the moment of their production; it is therefore advisable not to bring the eyes too near during the experiment, or else to cover them with glasses. These experiments always require great care to insure their success, which a trifling variation in the power of the battery, purity of the potassa, or moisture of the atmosphere, may prevent.—Soda is rather more difficult to decompose than potassa, and therefore requires to be employed in thinner pieces; the pieces of potassa should rarely exceed a quarter of an inch in thickness, and those of soda one-eighth of an inch.

157. To prevent the loss of the alkaline bases during their separation, by the powerful action of the air upon them, it has been proposed to effect

the decomposition under naphtha: the moist potassa being placed between two plates of platina in a proper vessel, which is to be filled with naphtha as soon as the contact with the battery is established; in this way the action of the air is prevented, but the naphtha decomposes, and hydrogen and charcoal are liberated, which renders the result less satisfactory than in the more simple form of the experiment. The most essential precautions are to preserve the alkali as dry as is consistent with a sufficient degree of conducting power, and to employ the battery in a moderate state of action, in which it does not produce a very intense heat, for that would destroy the metallic base at the moment of its production.

158. The amalgam of potassium, or sodium, with mercury, is easily procured; and may be obtained by a very moderate power. A glass tube, one-fourth of an inch diameter and three inches long, having a short platina wire sealed in one end, is to have mercury poured into it until the end of the platina wire is covered; the rest of the tube is to be filled with a concentrated solution of alkali, either pure or carbonated. The platina wire, surrounded by mercury, is then to be connected with the negative end of a Voltaic battery, and the circuit completed by bringing a platina wire from the positive end, in contact with the solution of alkali. Gas will be evolved from this wire, and the surface of the mercury will be greatly agitated; when the action grows weaker, the mercury may be poured into a glass of water, and the presence of the alkaline metal will be immediately indicated by the evolution of a cloud of minute bubbles of hydrogen gas, which may be collected by inverting over the mercury a small closed glass tube filled with water. This result has been frequently obtained with a battery of thirty pairs of plates of only two inches square.

159. The amalgam may be obtained more highly charged with the alkaline metal by employing a solid piece of alkali, with a small cavity on its surface, in which a globule of mercury is to be placed. The alkali is to be connected with the zinc surface of a battery, and the mercury with the copper surface; the mercury soon becomes more tenacious, and sometimes is converted into a soft solid mass, and in this state, if thrown into water, it produces a rapid decomposition.

160. The strong attraction of the metals of the alkalies for oxygen, renders them most active agents of chemical decomposition; by the strongest Voltaic power they can only be obtained in small quantity; and for the purpose of experiment they are now usually procured by another process first devised by the French chemists. A gun-barrel is bent nearly in the form of the letter S. An iron tube of the capacity of two cubic inches, having a small hole at the lower extremity and an iron stopper at the top, is ground into one end of the gun-barrel, and a tube of safety is fitted to the other. The iron tube is to be filled with pure dry potassa, and the bent part of the gun-barrel nearest to it, with clean iron turnings: this part of the barrel is to be luted and placed in a small blast furnace; the iron tube projecting out on one side, and the vacant part of the gun-barrel, with its attached tube of safety, charged with clean oil, or naphtha on the other. A strong heat is then to be raised in the furnace, and, when the iron turnings have attained an intense white heat, a small furnace is to be applied to the tube containing the potassa, which, being readily fused, will flow through the small hole at the bottom of the tube upon the iron turnings. The oxygen of the potassa combines with the heated iron, and the potassium condenses in brilliant laminæ in the vacant part of the gun-barrel, which must be kept cool by ice during the process. As potassa always contains water, that is also decomposed, and hydrogen escapes during the experiment, from the tube of safety; the cessation of this liberation of gas is the sign for removing the small furnace from the tube, and the heat being raised in the blast furnace for a few minutes, as high as possible, to expel the last portions of potassium from the iron, the whole apparatus is suffered to cool. The gun-barrel is then to be cut at the commencement of the part which has been kept cool, for there the greatest portion of potassium is usually found; it must be detached by a chisel in as large pieces as possible, and introduced quickly into naphtha, a portion of which fluid it is expedient to pour into the barrel as soon as it is first opened.

161. This process is attended with some difficulty, but it has been repeated successfully by many chemists in this country: a more detailed account of it may be consulted in the thirty-second volume of the Philosophical Magazine, pp. 89, and 276.

162. The composition of the fixed alkalies was entirely unknown before these experiments, but the volatile alkali, or ammonia, had been shown to consist of hydrogen and nitrogen, in the proportion of three of hydrogen to one of nitrogen by volume. Now it is singular, that of three bodies, whose properties are so analogous, two should be metallic oxides, and a third a compound of two gases; but there are experiments that seem to prove that either one or both of these gases contain a metallic substance, and that consequently ammonia may be, like the other alkalies, a metallic oxide.

163. Messrs. Berzelius and Pontin of Stockholm, discovered that when mercury is placed in a Voltaic circuit with a solution of ammonia, the mercury being connected with the copper-extremity of the battery, and the ammonia with the zinc, the mercury gradually expands to four or five times its original volume, and becomes a soft solid, nearly of the consistence of butter, having its metallic character quite unimpaired. It is very remarkable, that by this change it gains only about $\frac{1}{12000}$ part of its weight; yet has its specific gravity so much diminished, that, from being thirteen or fourteen times heavier than water, it becomes only three times heavier. By a short exposure to the atmosphere, it regains its original size and fluidity, absorbing oxygen and reproducing ammonia. When thrown into water a similar effect is produced, the water being decomposed and hydrogen liberated.

164. These phenomena are very analogous to those observed with the fixed alkalies; some substance combines with the quicksilver and alters its properties materially, without imparing its metallic character; now, according to all existing analogies, this substance must be a metal, and this metal, in returning to the state of alkali, absorbs oxygen, as is seen by its action on water. Hence it appears that ammonia consists of oxygen and a peculiar metal which may be called ammonium; but its analysis by other means evinces only the two gases, hydrogen and nitrogen; the former of these being the lightest of all gravitating bodies, is most probably a simple or elementary substance; and, on such a view, it would seem that nitrogen, though a gaseous body, is a compound of oxygen and a metal.

165. The amalgam of ammonium may be formed most readily by making a cavity in a moistened piece of muriate, or carbonate of ammonia, connected with the positive side of a Voltaic battery, and inserting in it a globule of mercury connected by a platina wire with the negative surface; in a few minutes a soft amalgam is formed; it must be transferred into water as quickly as possible when its action on that fluid is to be observed, as it changes by the shortest possible contact of the air.

166. Sir H. Davy has observed, that the strong attraction of potassium for oxygen, enables it to decompose ammonia even more rapidly than the Voltaic battery; and if an amalgam of potassium and mercury be placed in a cavity in moistened muriate of ammonia, it immediately increases in size, and becomes more consistent.

167. As some of the substances called earths resemble the alkalies in various properties, it was conjectured, that they also were metallic oxides; and this conjecture has been partly verified by the experiments of Messrs. Pontin and Berzelius, and Sir H. Davy. If a paste be formed with water, and either barytes, strontites, lime, or magnesia; and this paste be connected with the positive side of a Voltaic battery, and touched with an iron wire proceeding from the negative surface, the wire obtains the property of decomposing water.

168. If a globule of mercury be placed in a cavity in the earthy body, and touched with a wire proceeding from the copper end of the battery (the paste being connected with the zinc), an amalgam will be soon formed, which has the property of decomposing water, and forming with it a solution of the earth employed. If this amalgam be introduced into a little tube made of glass, and bent in the form of a retort, then filled with the vapor of naphtha and hermetically sealed; on the application of heat to the end of the tube containing the amalgam, the mercury will distil over and leave the pure metal of the earth behind. This process is rather difficult, and requires great care.

169. The amalgam from barytes, strontites, and lime, may be obtained with a battery of from 100 to 200 four-inch plates, in a moderate time; that from magnesia requires a longer continuance of the action of the battery, and the other earths do not readily yield to its powers. These metals are named from the earths of which they appear to be the bases, as follows: namely, that from barytes, barium; strontites, strontium; lime, calcium; magnesia, magnesium; alumine, aluminum; silex, silicum, &c.

170. The decomposition of the alkalies and earths which had previously resisted every attempt at analysis, are a monument of the importance of the Voltaic apparatus as an instrument of chemical research; and a proof of the ability with which it has been employed, which will be regarded with admiration and applause as long as science shall continue to be cultivated.

171. The phenomena that have been described as the consequences of Voltaic decomposition obtain in every variety of experiment. Sulphuric acid introduced into the Voltaic circuit gives off oxygen gas, and sulphur is deposited. Phosphoric acid evolves oxygen gas, and phosphorus combines with the negative wire. Ammonia separates into hydrogen and nitrogen with a small proportion of oxygen. Oils, alcohol, and ether, when acted on by a powerful battery, deposit charcoal, and give off hydrogen, or carborated hydrogen. And professor Brande has shown that when animal fluids containing albumen, are placed in the Voltaic circuit, the albumen is separated in combination with alkali at the negative wire, and in combination with acid at the positive wire; and that, with a powerful battery, it separates at the negative wire in the solid form; and with a less power, in the fluid form, so that it is probable animal secretion may depend on some such power.

Prior to an examination of the Voltaic apparatus there are some simple experiments that should be noticed.

172. If a wire of silver, and another of zinc, be immersed in a glass containing dilute muriatic acid, so as to remain at a little distance from each other, the zinc will give off hydrogen gas rapidly, but the silver will produce no effect. Bring the ends of the wires that are out of the acid in contact, by twisting them together; the quantity of hydrogen given off by the zinc will be diminished, and bubbles will be evolved from the silver.

173. If zinc, iron, or copper, are employed in the same way with gold, in dilute nitric acid, similar phenomena ensue, but the gas produced is nitrous gas.

174. If a wire of iron and another of silver are immersed in a solution of copper, the iron will soon become coated with copper, but the silver will remain unchanged. Bring the wires in contact, by twisting their upper extremities together, and the silver will be soon covered with a coat of copper.

175. Similar experiments may be made with a zinc and a silver wire, in solutions of lead or tin.

176. Dr. Wollaston, to whom we are indebted for the last two experiments, thus accounts for the result:—'We know that when water is placed in the circuit of conductors of electricity, between the two extremities of a pile, if the power is sufficient to oxidate one of the wires of communication, the wire connected with the opposite extremity affords hydrogen gas.

177. 'Since the extrication of hydrogen in this instance is seen to depend on electricity, it is probable, that in other instances, electricity may be also requisite for its conversion into gas. It would appear, therefore, that in the solution of a metal, electricity is evolved during the action of the acid upon it; and that the formation of hydrogen gas, even in that case, depends on a transition of electricity between the fluid and the metal.

178. 'We see moreover, in a former experiment, that the zinc, without contact of any other metal, has the power of decomposing water; and we can have no reason to suppose that the contact of the silver produces any new power, but that it serves merely as a conductor of electricity, and thereby occasions the formation of hydrogen gas.

179. 'In the last experiment, also, the iron by itself has the power of precipitating copper, by means of electricity evolved during its solution; and here likewise the silver, by conducting that electricity, acquires the power of precipitating the copper in its metallic state.'

180. The experiments of this ingenious philosopher, by which the attraction of alkali, and the precipitation of copper on the surface of silver, were produced by the influence of negative electricity, excited by the ordinary machine, were considered by him as favoring the preceding explanation, and proving that oxidation must be the primary cause of electric phenomena. To Mr. Singer, who furnishes the quotation, they did not appear to favor any such supposition, but rather the contrary; for in the experiment with two different wires, touching each other, both produced the same chemical effects, yet, observes Mr. S., 'if they are electrical at all, the one is positive and the other negative, as all experiments on the association of different metals prove; and if two wires that have no chemical action on the fluid in which they are immersed, be rendered respectively positive and negative, they are well known to produce different chemical effects.'

181. But it is said the chemical effect produced by the silver wire, arises from electricity communicated to it by the zinc; and that we have no reason to suppose that any new power is produced by the contact of the metals. Now, if this were the case, the mere conducting communication of the metals would be the only condition necessary to give the silver its chemical power; but the case is widely different, the communication must be not only conducting, but metallic, and even then no chemical effect will be produced, unless the extremities of the wires are immersed in the same liquid, or in two separate portions of liquid that have a conducting communication with each other.

182. Place two glasses filled with a solution of copper near each other. Make a compound arc, by twisting together the end of a wire of zinc, with the end of a similar wire of silver. Connect the two glasses by placing the silver leg of the arc in one, and the zinc in the other. The zinc will immediately attract copper from the solution, but it does not communicate that power to the silver, though they are both closely connected. Whilst the compound arc remains, connect the two glasses by a second arc, formed of a piece of bent wire of any kind, except gold or platina. The silver will be immediately covered with a coating of copper, and will continue to separate copper from the solution as long as the disposition of the apparatus remains the same. Now the only difference in the arrangement, that appears to have operated as a condition to the chemical power of the silver, was the provision of another conducting communication between the glasses, in addition to that established by the compound arc; it therefore appears, that the associated metals cannot serve as conductors to the effect produced; and indeed, if they did, it would be scarcely possible any accumulation of power could result from the increased number of plates in a Voltaic battery.

183. This experiment does not display any of the electric powers of a Voltaic combination; but it shows that the association of three different substances is essential to the chemical agency of such a combination; and the phenomena will be found to correspond with some experiments of M. De Luc, on the efficient groups in the Voltaic pile. This celebrated philosopher found that no chemical effects were produced by any Voltaic arrangements, unless two metals were employed with a liquid between them; and, in the experiment last described, zinc, silver, and a metallic solution were inactive, though in contact with each other, until the fluid was made the medium of conducting communication between the free extremities of the combined metals.

184. The experiment last described will succeed, when the two glasses containing the metallic solution, are connected by any moistened conductor; but the chemical power of the silver wire will be evinced slower, in proportion as the length of the moistened conductor is increased; and in all experiments of the kind, the less the interval between the extremities of the compound arc, the more rapid is its action on the interposed fluid. Hence, in the arrangements of Voltaic apparatus, for the purpose of chemical decomposition, the ends of the conducting wires are placed at a greater or less distance from each other, in proportion as their action is required to be more or less intense.

185. The arrangement of a simple Voltaic combination, by Mr. Sylvester, in which this effect is apparent, may be referred to. It consists of a tall glass jar filled with very dilute muriatic acid. Through a cork, placed in the neck of this jar, two wires are inserted; the one a short straight wire of zinc, the other a long bent wire of platina, or silver; by turning this last round, its upper end may be brought in contact with the zinc, or separated from it at pleasure. When they are separate, the zinc only is acted on; but, as soon as they are brought in contact, the platina or silver becomes covered with bubbles of gas, which appear soonest, and are evolved in the greatest quantity, from the projecting point.

186. Notwithstanding this circumstance, the power of a simple Voltaic combination con-

tinues to exert its effect, when the stratum of interposed fluid is considerable. If a tube of three feet long be filled with dilute muriatic acid, and a wire of platina be inserted through a cork in one of its extremities, and a wire of zinc in the other; on connecting the wires, gas will be soon evolved from the silver. If the tube be bent the effect will take place more slowly. Mr. Singer took two similar tubes of eighteen inches long, and connected them by a short piece of flexible pipe, so as to form together a tube of three feet in length, with a joint in the middle, which admitted of its employment either as a straight tube, or as a siphon with a bend of any required inclination. In the open ends of this tube he placed respectively a zinc, and a platina wire; and found that, whenever their outer ends were connected by a wire, hydrogen was soon evolved from the platina; but this effect took place soonest when the tube was straight, and hence it appears that the power put in motion by these combinations, can pass more readily through any given column of a fluid in a straight line, than in any other direction.

187. It has been seen, that, when any metal is in solution in the interposed fluid, it is revived by the wire which in other cases evolves hydrogen; and it has been shown, by the effect of the silver and the platina wire, that metals which have no chemical action on the interposed fluid alone, may decompose it when combined with another metal. These facts, though far from being perfectly understood, may serve to explain some chemical effects which were before rather obscure. If a zinc wire, for instance, be immersed in a solution of lead, the latter metal will be revived in the form of a metallic vegetation, which increases gradually by additions to its extremities. The first separation of the lead is sufficiently intelligible; the acid in which that metal is dissolved, having a stronger attraction for the zinc, dissolves a portion of it, and deposits on its surface an equal portion of lead. But the lead, so revived, continues to revive more, and to receive additions at its remote extremities, whilst it would have been rather expected these additions would have been made on the zinc, and the vegetation that had been first formed protruded further into the fluid by that means. The contrary result is now understood to be obtained, by the revived particles of lead forming a Voltaic combination with the zinc and the surrounding fluid. This effect is analogous to that which obtains in various other instances.

188. Spread a few drops of a solution of silver upon a pane of glass, and place a small piece of platina, and a similar piece of copper wire upon it, at a little distance from each other. A vegetation will take place about the copper wire; but no effect will be produced by the platina. Bring the wires in contact with each other, and the Voltaic combination thus formed will occasion a beautiful vegetation of metallic silver to surround the platina wire.

189. With a solution of tin, and wires of zinc and platina, similar phenomena occur; but a considerable time elapses, after the contact, before the vegetation appears round the platina. The immediate contact of the oxidable metal with the metallic solution is not absolutely necessary to the success of these experiments; it is only essential that a regular Voltaic circle, consisting of two different metals and a moist conductor be established.

190. If we take a glass tube having a piece of bladder tied over its lower extremity water tight, and a cork inserted in its upper end with a platina wire passing through it; and the tube be filled with acetate of lead, and placed in a small cup of zinc containing dilute muriatic acid; we shall find that, when a metallic communication is formed between this cup and the platina wire, the latter will become studded with brilliant crystals of metallic lead. In this case the oxidable metal has no connexion with the metallic solution but through the medium of the platina wire on the one side and moist bladder on the other.

191. Fill two similar glasses, the one with a solution of silver, the other with dilute muriatic acid; connect them by a compound wire arc of zinc and platina; the zinc being plunged in the muriatic acid, and the platina in the metallic solution. Immerse a second arc, formed of a bent silver wire, in the two glasses, one of its legs being in each; after some time the zinc wire will be entirely dissolved, and the platina will be found covered with minute crystals of metallic silver, displaying a very beautiful appearance under the microscope.

192. Copper and zinc are the metals most usually employed in the construction of Voltaic apparatus, for their effects are greater, in proportion to the value of the metals, than those of any other combination. Silver and zinc, or gold and zinc, would be more powerful, but not so much so as to compensate for the increased expense.

193. As the effects produced by a single pair of metals, of any size, are still exceedingly feeble, attempts were made to combine the action of several pairs. Professor Robinson arranged a series of zinc and silver plates, about the size of a shilling, so as to form a rouleau; and on applying his tongue to the edge of this, the sensation experienced was more manifest than by a simple pair of metals; but its power in other respects did not appear more considerable. In this arrangement every zinc plate was necessarily between two silver plates, and every silver plate between two of zinc, with the exception of the first and last. Now it has been stated, that the contact of zinc with silver, or copper, occasions some electric fluid to flow from either of those metals to it; and, consequently, when a single pair of metals are associated, the outer surface of the zinc appears positive, and that of the silver or copper negative. But if both surfaces of the zinc are in contact with copper or silver, electricity will flow into it in contrary directions, so that neither surface can exhibit the effect; and the same circumstance occurs, in a contrary order, when both surfaces of a silver or copper plate are in contact with zinc. Hence every arrangement of this kind, however numerous the pairs of metal, will exhibit at its opposite extremities the powers of a single pair of metals only.

194. Volta had the penetration to ascertain the cause of this defect in the rouleau of professor Robison; and his ingenuity supplied a means of obviating it. His experiments on the combination of two metals with an imperfect conductor (as water or saline fluids) had taught him that the electro-motive power of these fluids interfered but little with the more powerful energy of the combined metals; and that in fact they acted principally as conductors to that energy. He therefore interposed imperfect conductors of this kind between a series of pairs of metal, and thus combined their power without producing a counteracting current; for the zinc and silver, or zinc and copper, were then in contact with each other at one surface only, but the conducting communication existed throughout.

195. To construct an apparatus of this kind, procure a number of plates of zinc and copper, or zinc and silver, either round or square, of any size; and an equal number of pieces of cloth, leather, or pasteboard, of the same form, but rather smaller. Soak these last in salt water, until they are thoroughly moistened; place a plate of silver, or copper, upon the table, then upon that place a piece of zinc, and on the zinc one of the moistened discs; upon this a second series of silver, zinc, and moistened cloth (or pasteboard) in the same order; and thus consecutively until a series of fifty or sixty repetitions have been placed one upon the other. Particular care must be taken to place the plates in regular order; if in the first group silver is placed lowest, zinc next, and then the moistened disc, the same disposition must be observed throughout.

196. The Voltaic pile being thus formed, let the operator moisten both his hands with brine, and grasp a silver spoon in each. If the top of the pile be then touched with one spoon, and the bottom with the other, a distant but slight shock will be felt at every repetition of the contacts. This shock resembles very nearly the sensation produced by a very large electrical battery weakly charged; it is greater in proportion to the number of groups of which the pile is composed. If the communication is made with any part of the face near the eyes, or with a silver spoon held in the mouth, a vivid flash of light is perceived at the moment of contact, and that whether the eyes be open or shut.

197. The power of an apparatus of this kind continues for some time, but gradually diminishes, the zinc surfaces becoming oxidated by the action of the moisture; it therefore requires to be taken to pieces and cleaned, an operation that is very troublesome when the number of plates is considerable. This inconvenience was diminished by soldering each pair of zinc and copper plates together, instead of simply laying them on each other; and a further improvement was devised by Mr. Cruickshanks, which consisted in cementing the pairs of plates in regular order, in grooves made in the side of a mahogany trough, so as to form water-tight cells between each pair. These cells being filled with water, or any conducting fluid, served as a substitute for the moistened discs used in the pile; and, as the fluid could be easily poured out and replaced, it required considerably less time to keep it in proper order. This form of the apparatus, which is called the Voltaic trough, or battery, has been much used in this country; it is perhaps, on the whole the best arrangement hitherto devised, and its construction is sufficiently simple.

198. The zinc plates are made by casting that metal in an iron or brass mould; they may be about an eighth of an inch thick. The copper need not exceed twelve or fourteen ounces to the square foot, and may be soldered to the zinc at one edge only, the other three being secured by cement in the trough.

199. The trough must have as many grooves in its sides as the number of plates it is intended to contain, which should be fewer in proportion to their size, otherwise the apparatus will be inconvenient from its weight. When the plates are not more than three inches square their number in one trough may be fifty, and the distance of the grooves from three-eighths to half an inch. The trough must be made of very dry wood, and put together with white lead or cement. The plates being placed to the fire, the trough is to be well warmed, and placed horizontally on a level table, with its bottom downwards, very hot cement is then to be poured into it, until the bottom is covered to the depth of a quarter of an inch. During this process the plates will have become warm, and they are then to be quickly slided into the grooves and pushed firmly to the bottom, so as to bed themselves securely in the cement. In this way the plates are very perfectly cemented at the bottom, and, when this cement is sufficiently cool, a slip of thin deal is to be slightly nailed on the top edge of one of the sides of the trough, so as to overhang the inner surface about a quarter of an inch. The trough being about three quarters of an inch deeper than the diameter of the plates, there will be an interval between their top edges and the deal slip; and, when the side of the trough to which the slip is attached is laid flat upon the table, this interval forms a channel into which very hot cement is to be poured, and it will flow between each pair of plates, so as to cement one side of all the cells perfectly. As soon as the channel is quite full of fluid cement, the strip of deal is to be torn off, and the trough inclined so as to admit the superfluous cement to run out. When this is effected, and the cement cool, a slip of deal is to be nailed on the opposite side and the same process pursued with that. The instrument will then be cemented in the most perfect manner, and it may be cleaned off and varnished.

200. We may notice the preparation of electrical cements. The various cements employed in the construction of electrical apparatus are formed principally of resin, with the addition of some substances to render it more adhesive, and less brittle. Five pounds of resin, one pound of bees'-wax, one pound of red ochre, and two table spoonfuls of plaster of Paris, when melted, and well incorporated together, form a very good cement for general purposes. One that is well adapted for cementing large Voltaic batteries, and which is cheaper, may be formed of six pounds of resin, one pound of red ochre, half a

pound of plaster of Paris, and a quarter of a pint of linseed oil. Other cements in great variety, more or less fusible, &c., may be formed by combining the preceding ingredients in various proportions. The ochre and plaster of Paris should be well dried, and added to the other ingredients when they are well melted.

201. It must have occurred to those engaged in a series of Voltaic experiments, to observe the early exhaustion of power and the inequality of the action under the usual construction and management of the apparatus. The lecturer on this subject has more particularly felt such inconvenience; as during the progress of his experiments of elucidation he is obliged frequently to pause for explanation, during which time the power is on the decline.

202. To obviate these difficulties, Mr. Pepys has constructed a table, with drawers containing a suite of troughs, all the plates of which may be either raised out of the acid, or immersed into it, simultaneously. By means of a lever and counterpoise weight, the whole of the plates are as easily elevated as one series; all the communications with the prime conductors being, as in the same gentleman's Voltaic discharger, completed by quicksilver.

203. The troughs being enclosed within the table or chest, prevents the free escape of the acid vapors; and, where an opportunity offers of communication with a chimney or window, a pipe may be usefully added to carry them off.

204. Fig. 1, plate I., Electro-Galvanism, represents the external figure of the case.

205. Fig. 2. The internal arrangement of the whole contents (except the communication), the front being removed.

206. Fig. 3. Side view of the same, the side of the case, and drawers being removed.

207. Fig. 4. One of the drawers, with the spring supports, or props for the plates.

208. Fig. 5. Front view of the communications.

209. Fig. 6. Side view of ditto.

210. The Voltaic series consists of sixty pairs of plates, four inches square, each plate presenting its whole surface to the action of the acid; they are arranged in two drawers A, A, one above the other, each drawer containing three porcelain troughs *a*, *a*, *a*, and each trough ten pair of plates *b*, *b*, *b*; the plates are suspended from rods *c*, *c*, *c*, connecting each set of ten pairs together, and these rods drop into a square frame *d*, *d*, made to the full size of each drawer inside: the action of these frames lowers or raises the whole of the plates together, and is thus contrived.

211. B, B, are two rods passing through the upper board or table, and resting upon the short arm of the levers C, C, fig. 2, which are of wood; these rods have each two pairs of pins *e*, *f*; and which in fig. 2 are represented as employed, the plates being in action; but in fig. 3 the contrary, the lower drawer being open, and the frames, with plates supported by their props D, D. The drawers being first shut, the handles E, E, of the rod B, are to be turned inwards, as in fig. 2, when the pins *e*, *e*, enter the openings cut in the sides of the drawers at *g*, fig. 4, and stop in the grooves *h*, *h*, fig. 2, cut in the square frame *d*, to receive them; in the mean while, the shorter pins *f*, *f*, bearing upon the lower sides of the spring props D, press their upper end or points entirely within the thickness of the drawer on each side, and release the frames *d*, *d*. The whole weight of the plates, now bearing only upon the rods, is counterpoised by the weight *w*, which connects the two levers C, C; they are gradually let down into their several partitions, and the action of the battery commences; at the conclusion of the experiment the rods are again raised by the handles E, E, and when stopped, the pins *e*, having reached the top of the groove *g*, fig. 4, the handles are to be turned back into their former position, as in fig. 3; the props D, being now first released, shoot into the drawers, and support the frames when the pins *e*, *e*, have quitted them.

212. The communications between each trough are effected in the usual manner; but those which conduct the fluid from one drawer to the other, and from the opposite ends of the series to the upper board or table, are capable of being disengaged, and their connexions are effected under mercury, as in the Voltaic discharger.

213. They are thus arranged: *i*, *i*, *i*, are ivory cups containing mercury, and fixed to the drawers; *j*, *j*, *j*, are platina wires depending from them, and entering the troughs; *k* is a ring and wire, which effects the communication between the two drawers; and *l*, *l*, are the two wires which conduct the fluid from the opposite ends of the battery to the table, C being the copper, and Z the zinc end of the series.

214. We have stated that when the opposite extremities of a powerful Voltaic apparatus are connected by a wire, at the moment of contact a distinct spark is perceived, which occurs every time the contact is alternately broken and renewed. If the contact is made with a wire terminated at the end by a piece of well-burnt charcoal, the spark is considerably more vivid. And if two wires proceeding from the opposite ends of the battery are armed with charcoal points, and brought in contact with each other, the light evolved is more brilliant and intense than any that has been procured by other artificial arrangements. When the battery is powerful, the emission of light may be kept up for a considerable time; it is so dazzling as to fatigue the eye even by a temporary glance, and, when it ceases, leaves the most brilliantly illuminated room in apparent darkness.

215. This light appears to be principally derived from the immediate action of the Voltaic apparatus, and not from the combustion of the charcoal; for, though that is partly ignited, it suffers but comparatively little waste, and the light is evolved with equal splendor when the experiment is made in gases which contain no oxygen; and will even take place, though with diminished energy, under water, alcohol, ether oils, and other fluids whose conducting power is not too great.

216. The influence of the Voltaic spark on various gases may be ascertained by the apparatus represented at fig. 1, plate II., Electro-Galvanism, the wires within the globe being ter-

minated by pointed pieces of charcoal, instead of balls. When a globe of this kind has been exhausted and filled with sulphureted hydrogen, on taking the Voltaic spark in it, the sulphur is separated, and deposited on the interior of the globe, and produces, during its separation, a very beautiful appearance.

217. Some other compound gases are similarly affected; phosphorus separates from phosphureted hydrogen, and arsenic from arsenureted hydrogen.

218. With the most powerful Voltaic batteries the striking distance of the spark, or interval at which it passes from one conductor to another, is very considerable. Mr. Children measured this effect by means of a micrometer, attached to two polished points of platina, which were inserted in a receiver containing very dry air. With 1250 pairs of plates the points were brought within one-fifteenth of an inch of each other before the spark took place. With a large apparatus employed at the London Institution, which extends to 2000 pairs of four-inch plates, points of charcoal were brought within a thirtieth or fortieth of an inch of each other before any light was evolved; but, when the points of charcoal had become intensely ignited, a stream of light continued to play between them when they were gradually withdrawn even to the distance of nearly four inches. The stream of light was in the form of an arch, broad in the middle and tapering towards the charcoal points; it was accompanied by intense heat, and immediately ignited any substance introduced into it; fragments of diamond, and points of plumbago disappeared, and seemed to evaporate, even when the experiment was made in an exhausted receiver; though they did not appear to have been fused. Thick platina wire melted rapidly, and fell in large globules; the sapphire, quartz, magnesia, and lime, were distinctly fused.

219 In rarefied air, the discharge took place at a greater distance, and the beam of light was made to pass through an interval of six or seven inches.

220. These phenomena may be exhibited on a smaller scale by means of 100 pairs of plates, of six inches square, an apparatus which is well suited for all experiments of fusion and ignition.

221. The arched form of the stream of light, passing between two charcoal points, is often very perceptible when the distance of the points does not exceed half an inch.

222. From the low intensity of the most powerful Voltaic apparatus, but little attention to insulation is required in the transmission of its effects. The conductors employed for this purpose consist of copper wires passed through a short piece of glass tube, which serves as an insulator to hold them by. Such conductors are represented attached to the battery, and placed on a glass plate to inflame gunpowder, at fig. 2.

223. As the charcoal points usually become ignited when the battery has moderate power, almost any combustible substance may be inflamed, if placed between them. Oils, alcohol, ether, and naphtha, are decomposed when the points are plunged into them, and inflamed when they are brought near each other upon the surface.

224. Some of the most pleasing effects of the Voltaic apparatus result from its action on metals; if these substances, in thin leaves, are made the medium of communication between the opposite ends of a powerful battery, they inflame, and by continuing the contact may be made to burn with great brilliance. The best method of performing these experiments, is to suspend the metallic leaves to a bent wire proceeding from one extremity of the battery, and to bring in contact with them a broad metal plate connected with the opposite extremity; the brilliancy of the effect may be increased by covering the plate with gilt foil. Gold leaf burns with a vivid white light tinged with blue, and produces a dark brown oxide. Silver leaf emits a brilliant emerald-green light, and leaves an oxide of a dark gray color. Copper produces a bluish-white light attended by red sparks; its oxide is dark brown. Tin exhibits nearly similar phenomena; its oxide is of a lighter color. Lead burns with a beautiful purple light; and zinc with a brilliant white light, inclining to blue, and fringed with red. For the distinct appearance of these colors it is essential to make the contacts with the metal; for, if charcoal be used, the brilliant white light it evolves absorbs the colors produced by the combustion of the metals.

225. If a fine iron wire be connected with one extremity of a powerful battery, and its end be brought to touch the surface of some quicksilver connected with the other extremity, a vivid combustion both of the wire and the quicksilver results, and a very brilliant effect is produced.

226. If a fine iron wire of moderate length be made the medium of connexion between the extremities of the battery, it becomes ignited, and may be fused into balls; or if a platina wire is employed, it may be kept at a red, or even white, heat, for a considerable length of time; which seems to prove that some power is continually circulating through it; but however powerful the battery, wires are never dispersed by it, as they are by the action of a charged surface.

227. If the slender wire be inserted in any fluid, and then introduced into the Voltaic circuit, the fluid may be made to boil.

228. It has been noticed, that, if any two wires of different thicknesses are taken, on either of which a certain battery can produce ignition, a greater length of the thickest wire will be ignited than of that which is thinner. This effect may probably arise from the cooling influence of the air, for the surface of the thin wire is most extensive in proportion to its quantity of metal; and that the surrounding medium has an influence on the degree of ignition may be proved by another experiment.

229. Stretch a fine wire of platina, withinside a glass receiver, placed upon an air-pump, so that the air surrounding the wire may be removed or restored at pleasure. Ignite the wire to a dull red heat, by connecting its opposite extremities with the wires from a Voltaic battery, of sufficient power for that purpose

Rarefy the air by the action of the pump; and as the rarefaction proceeds, the ignition of the wire will become more vivid, until at length it obtains a glowing white heat. Admit air into the receiver, and the wire will lose its intense heat, and appear more dull than at first. Rarefy the air again, the ignition will increase. Restore it to its original density, it will again diminish. These effects may be repeated many times, and will maintain the same proportion to each other, though they are less intense at each repetition.

230. The power of a Voltaic apparatus increases with the number of plates it contains, within certain limits, but the limit is different for the various effects it produces, and varies also with the manner of employing the apparatus.

231. The effects have been stated by Volta to be in the simple ratio of the numbers, but very limited series only had been put together at the time this statement was made, and there appears to be a loss of power when very extensive arrangements are employed. The pure electrical effects, and the force of the shock, are found to increase with the number, and an arrangement of 1500 may be employed. The power of chemical decomposition, and transfer, also continues to increase with the number when the battery is excited by dilute acid; but, if it be charged with river water, the power does not increase after 400 or 500 plates. The powers of ignition have increased in exact proportion to the numbers within the limit of 100 plates, beyond that limit there appears to be a loss of power; for Sir H. Davy found that 100 plates ignited three inches of platina wire, one-seventieth of an inch diameter, and 1000 similar plates, charged in the same way, ignited only thirteen inches.

232. The French chemists have investigated the ratio of increase for different numbers of plates, as indicated by the quantity of gas liberated by the decomposition of water; and they announce that the increase is as the cube root of the number of plates. The apparatus they employed, was arranged in the form of troughs of a particular construction, being part of a large apparatus constructed by order of the French government. Sir H. Davy states, that he has made similar experiments with the large combination of porcelain troughs, employed in the Royal Institution, and the results he obtained indicate an increase nearly as the squares of the numbers.

233. The result of every experiment of the kind must be uncertain if a series of minute attentions are not observed, which appear to have been overlooked in those already instituted. The vessels employed for the decomposition should be of the same size and form; the wires of the same length and thickness, and placed at equal distances from each other, in a fluid of uniform conducting power.

234. When the size of the plates is increased, their effects on perfect conductors, such as metals, charcoal, and strong acid solutions, are greatly augmented; but their action on imperfect conductors, as water, and various weak saline solutions, remains unaltered. If a battery, for instance, of thirty pairs of plates of two inches square, be compared with another battery of thirty plates, of six inches square, charged with diluted acid of the same strength; there will be no material difference in the shock they produce, or the quantity of water they decompose in a given time; but the small battery will not melt wire, or burn metals, and will scarcely produce a spark between two points of charcoal; whilst the large battery will evolve a brilliant light between the charcoal points, deflagrate metallic leaves with rapidity, and ignite several inches of wire.

235. This remarkable fact, which appears to have been first noticed by the French chemists, is susceptible of some explanation (on the supposition that the phenomena are electrical). If a Leyden jar, for instance, having a square foot of coated surface, be applied to an electrical machine with another jar, whose coated surface is equal to four square feet; after a certain number of turns of the machine, they will both be charged, and to the same intensity, for they will equally affect an electrometer. But the large jar will contain four times the quantity of electricity that the small one does, and will fuse sixteen times the quantity of wire.

236. Now, suppose an imperfect conductor, capable of transmitting only such a quantity of electricity as is adequate to the charge of half a square foot; and it is obvious either of the jars before mentioned would produce the same effect on such a substance; for they both contain more than it can transmit, and its conducting power, which remains the same in both cases, limits the effect that can be produced by either. It is consequently found, that, if several different sized jars are charged to the same degree, the shock is nearly equally painful when received from either of them.

237. Mr. Cavendish has stated, that 'iron wire conducts 400,000,000 times better than rain or distilled water; that is, the electricity meets with no more resistance in passing through a piece of iron wire 400,000,000 inches long, than through a column of water of the same diameter only one inch long. Sea water, or a solution of one part of salt in thirty of water, conducts 100 times, and a saturated solution of sea salt about 720 times better than rain water.' It is therefore probable, that the power excited by a Voltaic apparatus, with plates of two inches square, is in quantity equal or superior to the conducting capacity of most aqueous fluids, and consequently no increased effect can be produced on such fluids by larger plates, which increase the quantity of that power, but not its intensity. But if a conductor be presented to the large plates, which is capable of receiving the increased quantity furnished, the effect must necessarily be greater on such conductors, in proportion to the increased impulse it may be supposed to receive. These facts are capable of easy illustration.

238. Let two wires, proceeding from the extremities of a battery of fifty or 100 plates of two inches square, be plunged in separate glasses of water, if the glasses are connected by putting a finger into each of them, a shock will be felt at the moment of contact. Connect the water

in the glasses by some fibres of moistened cotton, or by an inverted syphon filled with water; on repeating the contact with this arrangement, either no shock, or a very slight one will be felt. Make a similar experiment with another battery of the same extent, but with plates of six inches square. The shock will be nearly as great when the glasses are connected by moistened fibres, as when no connexion exists between them; and whilst the circuit exists through the moistened fibres, and the human body, if a third circuit be formed through a fine wire, several inches of it may be ignited. The imperfect conductors being incapable of conducting more than a small portion of the power excited by the large plates.

239. Whatever be the cause of the power of the Voltaic apparatus, the quantity of that power excited by any given number of plates under similar circumstances, will be in direct proportion to the size of the plates; and if the power be electricity, or should obey the same law that operates with charged surfaces, the comparative action of different sized batteries, containing the same number of plates, should be, with regard to their power of igniting wire, in the proportion of the square of the increased surface; thus if two batteries are taken, one containing fifty plates of twenty square inches surface, and the other fifty plates of forty square inches, the latter ought to ignite four times the length of wire the former can ignite. From some experiments with plates of four inches square, and others with plates of eight inches square, made many years since, it has been stated by Dr. Wilkinson, 'that the power of ignition, in batteries of the same total surface, but with plates of different sizes, increases in the proportion of the squares of the surfaces of the elementary plates, singly taken in each.' It was afterwards shown by Mr. Harrison of Kendal, that when the total surfaces are not equal, the rate of ignition must be as the sixth power of the diameters of the elementary plates, or as the cubes of their respective surfaces.

240. It appears also from some experiments with large plates, mentioned by Sir H. Davy, that the power of ignition, for equal number of plates, probably increases in a higher proportion than the squares of their surfaces; for twenty double plates, each exposing a surface of eight square feet, ignited more than sixteen times as much wire as twenty double plates, having each a surface of two square feet.

241. Several curious galvanic experiments and observations have been published by M. Bichat, author of a very celebrated work on anatomy. In speaking of the influence of the destruction of the brain on that of the heart, after having proved, conformably to observation and experience, that it is not immediately by the interruption of the cerebral action that the heart ceases to act, he confirms this fundamental datum of physiology and pathology, by a series of galvanic experiments, which demonstrate that the heart is in all cases independent of the brain.

242. 'These experiments,' he observes, 'were made by me with the most scrupulous attention, because several very respectable authors have recently advanced an opinion contrary to mine and have endeavoured to prove that the heart, together with the other muscles of organic life, do not differ, as to their susceptibility to the galvanic influence, from the different muscles of animal life. I shall begin by a detail of the observations I have made on animals with red and cold blood.

243. (1.) 'In several experiments made on frogs, I coated the brain, on the one hand with lead, and the heart and muscles of the inferior extremities, on the other, with a long lamina of zinc, the upper end of which touched the heart, and the lower end the muscles. Having, by the means of silver, established a communication between the coatings of the muscles and those of the brain, the movements of the limbs constantly followed; but I could not perceive any acceleration in the contractions of the heart, when it still continued to beat; and, when its action had entirely ceased, it did not display the smallest movement. Whichever may be the voluntary muscle that is coated at the same time with the heart, with a view to a comparison of the phenomena they exhibit at the moment of the metallic communication, there is constantly a marked and decided difference.

244. (2.) 'In the case of other frogs, I coated, with a common metallic wire, on the one hand, the cervical part of the spinal marrow, in the upper region of the heart, to the end that the coating might be above the part where the nerves which proceed from the great intercostal nerve, and thence to the heart, originate; and, on the other hand, the heart, and any one of the voluntary muscles. I constantly noticed a result similar to the one which attended the preceding experiment, whenever the communication was established. There were invariably violent agitations in the voluntary muscles, without any visible alteration in the contractile movements of the heart.

245. (3.) 'I endeavoured to denudate the nerves which lead to the heart of frogs. Several grayish filaments, scarcely perceptible, with the nature of which I must acknowledge I am not positively acquainted, were coated with a metallic substance, at the same time that the heart was made to rest on a substance of a similar nature. When the communication was established by the means of a third metal, not the smallest sensible effect was to be perceived.'

246 Dr. Wilson Philip has made some curious experiments on the influence of the Voltaic battery in obviating the effects of the division of the eight pairs of nerves. In some experiments in which the nerves of the eighth pair were divided in the neck of a rabbit, and the ends not displaced, and the animal was allowed to live some hours, it was found that food swallowed immediately before the division of the nerves, was considerably digested, even when the divided ends of the nerves had separated to the distance of a quarter of an inch from each other.

247. In other experiments in which, after the division of the nerves, the divided ends had been turned completely away from each other, little or no perfectly digested food, when the animal

was allowed to live some hours, was found in the stomach: and the longer the animal lived, the smaller was the proportion of digested food in the stomach, the great mass having the appearance of masticated food, which was not sensibly lessened in quantity, however long the animal lived. In an experiment in which, under some circumstances, the stomach was exposed, from the time of the division of the nerves, to the influence of a Voltaic battery sent through the lower portion of the divided nerves, its contents were apparently as much changed as they would have been in the same time in the healthy animal. The change was also of the same kind, the contents of the stomach assuming a dark color, and those of the pyloric end being more uniform, and of a firmer consistence than those of the central and cardiac portions of the stomach, while the whole contents became less in quantity.

248. The division of the nerves, in both ways, produced difficulty of breathing and efforts to vomit; neither of which occurred, when the stomach and lungs were brought under the influence of a Voltaic battery, sent through the lower portion of the divided nerves.

249. When, under the foregoing circumstances, the lungs had not been exposed to the Voltaic influence, and the animal had been allowed to live for five or six hours, they were found much affected: in the rabbit which had been submitted to this influence, they seemed quite healthy.

250. An account of some very interesting experiments performed by Dr. Ure, on the body of a criminal executed in the north, was read before the Glasgow Literary Society. The paper commences with some appropriate general physiological views relating to the application of galvanism, in which the author notices particularly the researches of Dr. Wilson Philip on the relation between Voltaic electricity and the phenomena of life. The author gives the following detail of his experiments.

251. 'The subject of these experiments was a middle-sized, athletic, and extremely muscular man, about thirty years of age. He was suspended from the gallows nearly an hour, and made no convulsive struggle after he dropped; while a thief executed along with him, was violently agitated for a considerable time. He was brought to the anatomical theatre of the University of Glasgow in about ten minutes after he was cut down. His face had a perfectly natural aspect, being neither livid nor tumefied; and there was no dislocation of his neck.

252. 'Dr. Jeffrey, the distinguished professor of anatomy, having on the preceding day requested me to perform the galvanic experiments, I sent to his theatre with this view, next morning, my minor Voltaic battery, consisting of 270 pairs of four-inch plates, with wires of communication, and pointed metallic rods with insulating handles, for the more commodious application of the electric power. About five minutes before the police officers arrived with the body, the battery was charged with a dilute nitro-sulphuric acid, which speedily brought it into a state of intense action. The dissections were skilfully executed by Mr. Marshall, under the superintendence of the professor.

253. 'Experiment I.—A large incision was made into the nape of the neck, close below the occiput. The posterior half of the atlas vertebra was then removed by bone forceps, when the spinal marrow was brought into view. A considerable incision was at the same time made in the left hip, through the great gluteal muscle, so as to bring the sciatic nerve into sight; and a small cut was made in the heel. From neither of these did any blood flow. The pointed rod connected with one end of the battery was now placed in contact with the spinal marrow, while the other rod was applied to the sciatic nerve. Every muscle of the body was immediately agitated with convulsive movements, resembling a violent shuddering from cold. The left side was most powerfully convulsed at each renewal of the electric current. On moving the second rod from the hip to the heel, the knee being previously bent, the leg was thrown out with such violence as nearly to overturn one of the assistants, who in vain attempted to prevent its extension.

254. 'Experiment II.—The left phrenic nerve was now laid bare at the outer edge of the sterno-thyroideus muscle, from three to four inches above the clavicle; the cutaneous incision having been made by the side of the sterno cleido-mastoideus. Since this nerve is distributed to the diaphragm, and since it communicates with the heart through the eighth pair, it was expected by transmitting the galvanic power along it, that the respiratory process would be renewed. Accordingly, a small incision having been made under the cartilage of the seventh rib, the point of the one insulating rod was brought into contact with the great head of the diaphragm, while the other point was applied to the phrenic nerve in the neck. This muscle, the main agent of respiration, was instantly contracted, but with less force than was expected. Satisfied, from ample experience on the living body, that more powerful effects can be produced in galvanic excitation, by leaving the extreme communicating rods in close contact with the parts to be operated on, while the electric chain or circuit is completed, by running the end of the wires along the top of the plates in the last trough of either pole, the other wire being steadily immersed in the last cell of the opposite pole, I had immediate recourse to this method. The success of it was truly wonderful. Full, nay laborious breathing instantly commenced. The chest heaved, and fell; the belly was protruded, and again collapsed, with the relaxing and retiring diaphragm. This process was continued, without interruption, as long as I continued the electric discharges.

255. 'In the judgment of many scientific gentlemen who witnessed the scene, this respiratory experiment was perhaps the most striking ever made with a philosophical apparatus. Let it also be remembered, that, for full half an hour before this period, the body had been well nigh drained of its blood, and the spinal marrow severely lacerated. No pulsation could be perceived meanwhile at the heart or wrist; but it may be supposed that, but for the evacuation of the blood, the essential stimulus of that organ, this phenomenon might also have occurred.

256. 'Experiment III.—The supra-orbital nerve

was laid bare in the forehead, as it issues through the supra-ciliary foramen, in the eye-brow: the one conducting rod being applied to it, and the other to the heel, most extraordinary grimaces were exhibited every time that the electric discharges were made, by running the wire in my hand along the edges of the last trough, from the 220th to the 227th pair of plates; thus fifty shocks, each greater than the preceding one, were given in two seconds: every muscle in his countenance was simultaneously thrown into a fearful action; rage, horror, despair, anguish, and ghastly smiles, united their hideous expression in the murderer's face, surpassing far the wildest representations of a Fuseli or a Kean. At this period several of the spectators were forced to leave the apartment from terror or sickness, and one gentleman fainted.

257. 'Experiment IV.—The last galvanic experiment consisted in transmitting the electric power from the spinal marrow to the ulnar nerve, as it passes by the internal condyle at the elbow; the fingers now moved nimbly, like those of a violin performer; an assistant, who tried to close the fist, found the hand to open forcibly, in spite of his efforts. When the one rod was applied to a slight incision at the tip of the fore-finger, the fist being previously clenched, that finger extended instantly; and, from the convulsive agitation of the arm, he seemed to point to the different spectators, some of whom thought he had come to life!'

258. An hour was spent in these experiments, when an experiment was made with the view of determining the quantity of residual air in the lungs; after the detail of which, the author proceeds as follows.

259. 'In deliberating on the above galvanic phenomena, we are almost willing to imagine, that if, without cutting into and wounding the spinal marrow and blood-vessels in the neck, the pulmonary organs had been set a-playing at first (as I proposed), by electrifying the phrenic nerve (which may be done without any dangerous incision), there is a probability that life might have been restored. This event, however little desirable with a murderer, and perhaps contrary to law, would yet have been pardonable in one instance, as it would have been highly honorable and useful to science. From the accurate experiments of Dr. Philip, it appears that the action of the diaphragm and lungs is indispensable towards restoring the suspended action of the heart and great vessels, subservient to the circulation of the blood.

260. 'It is known that cases of death-like lethargy, or suspended animation from disease and accidents have occurred, where life has returned, after longer interruption of its functions than in the subject of the preceding experiments. It is probable, when apparent death supervenes from suffocation with noxious gases, &c., and when there is no organic defect, that a judiciously directed galvanic experiment will, if any thing will, restore the activity of the vital functions. The plans of administering Voltaic electricity hitherto pursued in such case, are, in my humble apprehension, very defective. No advantage, we perceive, is likely to accrue from passing electric discharges across the breast, directly through the heart and lungs. On the principles so well developed by Dr. Philip, and now illustrated on Clydsdale's body, we should transmit along the channel of the nerves, that substitute for nervous influence, or that power which may perchance awaken its dormant faculties. Then, indeed, fair hopes may be formed of deriving extensive benefit from galvanism; and of raising this wonderful agent to its expected rank, among the ministers of health and life to man.

261. 'I would, however, beg leave to suggest another nervous channel, which I conceive to be a still readier and more powerful one to the action of the heart and lungs than the phrenic nerve. If a longitudinal incision be made, as is frequently done for aneurism, through the integuments of the neck at the outer edge of the sterno-mastoideus muscle, about half way between the clavicle and angle of the lower jaw; then, on turning over the edge of this muscle, we bring into view the throbbing carotid, on the outside of which the par vagum and great sympathetic nerve lie together in one sheath. Here, therefore, they may both be directly touched and pressed by a blunt metallic conductor. These nerves communicate directly or indirectly with the phrenic, and the superficial nerve of the heart is sent off from the sympathetic.

262. 'Should, however, the phrenic nerve be taken, that of the left side is the preferable of the two. From the position of the heart, the left phrenic differs a little in its course from the right. It passes over the pericardium, covering the apex of the heart.

263. 'While the point of one metallic conductor is applied to the nervous cords above described, the other knob ought to be firmly pressed against the side of the person, immediately under the cartilage of the seventh rib. The skin should be moistened with a solution of common salt, or, what is better, a hot saturated solution of sal ammoniac, by which means the electric energy will be more effectually conveyed through the cuticle, so as to complete the Voltaic chain.

264. 'To lay bare the nerves above described, requires, as I have stated, no formidable incision, nor does it demand more anatomical skill, or surgical dexterity, than every practitioner of the healing art ought to possess. We should always bear in mind that the subject of experiment is at least insensible to pain; and that life is at a stake, perhaps irrecoverably gone. And assuredly, if we place the risk and difficulty of the operations in competition with the blessings and glory consequent on success, they will weigh as nothing with the intelligent and humane.' It is possible, indeed, that two small brass knobs, covered with cloth moistened with solution of sal ammoniac, pressed above and below on the place of the nerve and the diaphragmatic region, may suffice, without any surgical operation. It may first be tried.

265. 'Immersion of the body in cold water accelerates greatly the extinction of life arising from suffocation; and hence less hopes need be entertained of recovering drowned persons after a considerable interval, than when the vital heat has been suffered to continue with little abate-

ment. None of the ordinary practices judiciously enjoined by the Humane Society, should ever, on such occasions, be neglected. For it is surely criminal to spare any pains which may contribute, in the slightest degree, to recall the fleeting breath of man to its cherished mansion.'

266. We have hitherto confined ourselves to the effects of small batteries, but we must not omit to notice the powerful Voltaic apparatus constructed by Mr. Children, as well as the results obtained by it, or the more portable as well as powerful arrangement by Mr. Pepys. In the first of these arrangements, the copper and zinc plates of the apparatus were connected together, in the usual order, by leaden straps, six feet long by two feet eight inches broad, each plate presenting thirty-two square feet of surface. All the plates being attached to a strong wooden frame suspended by ropes and pulleys, which, being balanced by counterpoises, was easily lowered and elevated, so as to immerse the plates in the acid, or raise them out of it at pleasure. The cells of the battery were twenty-one in number, and their united capacities amounted to 945 gallons. To each pole of the battery a leaden pipe, about three-fourths of an inch in diameter, was attached by solder, and the opposite end of each pipe immersed in a basin of mercury (a separate basin for each pipe), by means of which the circuit was completed, and a perfect contact ensured. The battery was afterwards improved at the suggestion of Dr. Wollaston, and the copper coiled completely round each zinc surface. See fig. 3, plate II. The first experiments we shall mention were made on the comparative facility with which different metals are ignited when placed in the electrical circuit. For this purpose, in each experiment, two wires of dissimilar metals were taken, of equal diameter and length; one end of each was in contact with one of the basins of mercury communicating with the poles of the battery, and the other end bent to an angle, and the wires connected continuously by hooking them together. The length of each wire was eight inches, and the diameter one-thirtieth of an inch. The battery was moderately excited by a charge of one part acid diluted with forty parts of water.

267. Experiment I.—A platina and a gold wire being thus connected, and introduced into the electrical circuit, the platina was instantly ignited, the gold remained unaffected.

268. Experiment II.—A similar arrangement of gold and silver wires. The gold was ignited, the silver not.

269 Experiment III.—The same with gold and copper. No perceptible difference in the state of ignition; both metals were heated red.

270. Experiment IV.—Gold and iron. The iron was ignited; the gold unchanged.

271. Experiment V.—Platina and iron. The iron ignited instantly at the point of contact next the pole of the battery. Then the platina became ignited through its whole extent. After this the iron became more intensely heated than the platina, and the ignition of the latter decreased.

272. Experiment VI.—Platina and zinc. The platina was ignited: the zinc was not; but melted at the point of contact. In a subsequent experiment, the zinc did not melt; but the platina ignited as before.

273. Experiment VII.—Zinc and iron. The iron was ignited: the zinc bore the heat without fusing.

274. Experiment VIII.—Lead and platina. The lead fused at the point of contact.

275. Experiment IX.—Tin and platina. The tin fused at the point of contact. No ignition of either wire took place in the two last experiments.

276. Experiment X.—Zinc and silver. The zinc was ignited before it melted: the silver was not ignited.

277. The results in every case were the same to whichever pole of the battery either wire was presented. These experiments were varied by introducing several alternations of different wires continuously connected, into the circuit, and obtained in every instance analogous results. Thus,

278. Experiment XI.—Alternations of platina and silver, three times repeated: all the platina wires were ignited, and none of the silver.

279. Experiment XII.—One zinc wire between two platina: both the platina wires were ignited, the zinc not.

280. Experiment XIII.—One iron between two platina. Both the latter first ignited; then the iron, which soon became fully heated, and fused.

281. It is unnecessary to enter into a farther detail of these experiments; it will be sufficient to say generally, that when wires of several different metals were introduced at once into the circuit, the order of their ignition was precisely that of the former experiments. In one experiment the copper was decidedly most heated.

282. To explain these phenomena, Mr. Children supposes that when a perfect communication is established between the poles of the battery, the electricity circulates without producing any visible effect; but, if it meet with resistance in its passage, it manifests itself by chemical action, by the evolution of heat, or both. Thus, if a bar of metal be connected with one pole of the battery, and its extremity immersed in a basin of mercury connected with the other pole, at the instant the surfaces come in contact, heat and light are evolved, which cease as soon as the bar, if it be of sufficient size, is fairly plunged beneath the surface of the quicksilver. If the circuit be completed by two pieces of charcoal, the evolution of heat and light is permanent, as long as their surfaces remain in contact, because that contact can never be so perfect, as to oppose no resistance to the electricity; whereas, in the case of the bar of metal and the mercury, it soon becomes complete, and the current is then uninterrupted. Resistance, therefore, appears to occasion the development of heat (whatever be the ultimate cause of the phenomenon), and as this must be inversely as the conducting power, when any two of the wires connected continuously are placed in the circuit, that which is the worst conductor must be most heated; and thus platina, having the lowest conducting power, is ignited before all

the rest; and silver, which conducts best, is not heated red when connected with any of the other metals.

283. The following experiments were made with the battery in a high state of excitation; and Mr. Children considers them as representing nearly the maximum of effect which it is capable of producing. As the quantity of acid was increased from time to time, and that previously added often almost spent before fresh was put in, it is not easy to say exactly what proportion it bore to the water; perhaps the largest may be stated at about $\frac{1}{30}$th. On this, as on former occasions, he found a mixture of nitrous and sulphuric acids, to produce the most powerful and permanent effects.

284. Experiment I.—Five feet six inches of platina wire, $\frac{11}{100}$ of an inch in diameter, were heated red throughout, visible in full daylight.

285. Experiment II.—Eight feet six inches of platina wire, $\frac{11}{100}$ of an inch in diameter, were heated red.

286. Experiment III.—A bar of platina $\frac{1}{6}$ of an inch square, and $2\frac{1}{4}$ inches long, was also heated red, and fused at the end; and,

287. Experiment IV.—A round bar of the same metal, $\frac{275}{1000}$ of an inch in diameter, and $2\frac{1}{4}$ inches long, was heated bright red throughout.

288. Experiment V.—Fine points of boxwood charcoal intensely ignited in chlorine, neither suffered any change, nor produced any in the gas. The result was similar when heated in azote.

289. Mr. C. next tried the power of the battery to fuse several refractory substances. The subject of experiment was placed in a small cavity, made in a piece of well burnt boxwood charcoal, floating on the surface of the mercury in one of the basins before mentioned, and the circuit completed by another piece of charcoal, communicating by stout copper wire with the other basin.

290. Experiment I.—Oxide of tungsten, which (as well as other metallic oxides operated on) had been previously intensely ignited in a charcoal crucible, in a powerful furnace, fused, and was partially reduced. The metal grayish white, heavy, brilliant, and very brittle.

291. Experiment II.—Oxide of tantalum. A very small portion fused. The grains have a reddish-yellow color, and extremely brittle.

292. Experiment III.—Oxide of uranium; fused, but not reduced.

293. Experiment IV.—Oxide of titanium; fused, not reduced. When intensely heated, it burnt, throwing off brilliant sparks like iron.

294. Experiment V.—Oxide of cerium; fused, and when intensely heated it burnt with a large, vivid white flame, and was partly volatilised, but not reduced. The fused oxide, on exposure for a few hours to the air, fell into a light brown powder, containing numerous shining particles of a silvery lustre interspersed amongst it, and exhaled an odor, similar to that of phosphureted hydrogen.

295. Experiment VI.—Oxide of molybdena; readily fused and reduced. The metal is very brittle, of a steel gray color, and soon becomes covered with a thin coat of purple oxide.

296. Experiment VII.—Compound ore of iridium and osmium; fused into a globule.

297. Experiment VIII.—Pure iridium; fused into an imperfect globule, not quite free from small cavities, and weighing 7·1 grains. The metal is white, very brilliant, and in its present state its specific gravity is 18·68, which must be much too low, on account of the porous state of the globule. In the Minutes of the Experiments, in July 1813, mention is made of the fusion of a small portion of pure iridium into a globule weighing $\frac{93}{100}$ of a grain, which had been previously submitted to the action of a battery of 2000 plates, of four inches square, without melting.

298. Experiment IX.—Ruby and sapphire, were not fused.

299. Experiment X.—Blue spinal ran into a slag.

300. Experiment XI.—Gadolinite, fused into globules.

301. Experiment XII.—Magnesia was agglutinated.

302. Experiment XIII.—Zircon from Norway was imperfectly fused.

303. Experiment XIV.—Quartz, silex, and plumbago, were not affected.

304. In the year 1796 M. Clouet converted iron into steel, by cementation with the diamond, with the view of confirming the nature of that substance, and of ascertaining the exact state in which carbon exists in steel. Clouet had also previously formed steel by cementation with carbonate of lime. Mr. Mushet repeated this experiment, using, instead of the carbonate, caustic lime, and obtained also what he considered to be cast steel; whence he concluded that the carbon necessary to convert the iron into steel had not been furnished, as Clout supposed, by decomposition of the carbonic acid, but that it had found its way from the ignited gas of the furnace to the iron. This result occasioned suspicions of the accuracy of the deductions from the experiment with the diamond; and Mr. Mushet accordingly, at the suggestion of the editor of the Philosophical Magazine, repeated the experiment made at the Polytechnic School, only keeping out the diamond. The results (for he made several experiments), uniformly gave him good cast steel, whence he concludes that we are still without any satisfactory or conclusive proof of the steelification of iron solely by means of the diamond; and adds that he doubts whether the diamond afforded even one particle of carbon to the iron. The details of both Clouet's and Mushet's experiments, may be found in the fifth volume of the Philosophical Magazine. Sir George M'Kenzie repeated both results confirming the conclusions of the French chemist. The labors of this gentleman would at first view appear conclusive; but, if a doubt should remain, it occurred to Mr. Pepys, that the battery would afford an experimentum crusis on the subject; and his ingenuity readily suggested a mode of making it, every way unobjectionable. He bent a wire of pure soft iron, so as to form an angle in the middle, in which part he divided it longitudinally, by a fine saw. In the opening, so formed, he placed diamond powder, securing it in its situa-

tion by two finer wires, laid above and below it, and kept from shifting, by another small wire, bound firmly and closely round them. All the wires were of pure soft iron, and the part containing the diamond powder was enveloped by thin leaves of talc. Thus arranged, the apparatus was placed in the electrical circuit, when it soon became red hot, and was kept so for six minutes. The ignition was so far from intense, that few who witnessed the experiment expected any decisive result. On opening the wire, however, Mr. Pepys found that the whole of the diamond had disappeared; the interior surface of the iron had fused into numerous cavities, notwithstanding the very moderate heat to which it had been exposed; and all that part which had been in contact with the diamond was converted into perfect blistered steel. A portion of it being heated red, and plunged into water, became so hard as to resist the file, and to scratch glass. This result is conclusive; for as the contact of any carbonaceous substance, except the included diamond, was effectually guarded, to that alone can the change produced in the iron be referred. This experiment will also probably be deemed fatal to the opinion of those mineralogists (if any do still maintain that opinion), who class the diamond with substances of the siliceous genus.

305. When dry caustic potassa was exposed to the intense heat between the two pieces of charcoal, it fused, and appeared to decompose, throwing off a large flame of the peculiar purple color, that attends the combustion of potassium. When moist caustic potassa was placed in the circuit, the water only was decomposed.

307. The second apparatus was constructed under the immediate direction of Mr. Pepys for the London Institution, and the great portability of this gigantic galvanic spiral gives it an especial claim to the notice of the scientific world. The apparatus is shown at fig. 4.

308. The two tubs, T, T, are somewhat larger than the metallic coil. The one beneath the weight is intended as a receptacle for water, while the other is charged with dilute acid.

309. The spiral M is suspended by a cord, and balanced by the weight W; the beam over which the cord passes being moveable on a central axis at the top of the upright piece of timber.

310. The coil consists of two plates, each fifty feet in length and two feet in width; the one copper, and the other zinc, making a superficial surface of 400 feet. They are rolled or wrapped round a cylinder of wood, with three strands or ropes of horse-hair between each plate, to prevent contact of the metals; and, to maintain these in their situation, notched sticks are occasionally introduced in the rolling. Two conductors of copper, near three-fourths of an inch in thickness, are firmly attached to the end of each plate, from which the power is dispensed upon immersion in the acid.

311. Rather more than fifty gallons of dilute acid are requisite to charge the receptacle intended for the metallic spiral; and, to put the apparatus in operation, the coil is gradually lowered into the tub beneath. The immersion of the spiral, however, displaces a certain portion of water; so that it is necessary to restore the equilibrium by withdrawing one of the balance-weights. In the apparatus actually employed in the theatre of the London Institution, there is but one tub employed; but in the improved form, represented in the diagram, it may be removed to a vessel of water, and its maximum effect produced by a subsequent immersion in the dilute acid.

312. As a mere electrical battery, the effect to be derived from this pair of plates is comparatively small; but its powers as an agent for illustrating the connexion between magnetism and electricity are truly astonishing.

313. Magnetic needles, placed at a distance of several feet from the apparatus, were readily put into motion, and deflected from their previous position. The most singular phenomenon, however, which resulted from the series of experiments with this extraordinary instrument, remains to be noticed:—A spiral of wire was connected with the two poles of the battery shown at C, C, and, being placed in a perpendicular direction, a steel cylinder was dropped from the upper end, and this, instead of obeying the ordinary laws of gravitation, was found, after a few oscillations, to take a position somewhere midway between the two extremities of the tube.

# ELECTRO-MAGNETISM.

314. The connexion between galvanism and magnetism must now be examined. The term electro-magnetism has been employed to designate a science which has originated since the commencement of the present century, and which has received no ordinary attention from the continental philosophers, as well as from those of our own country. Amongst those who have done most towards the development of electro-magnetism, we may especially enumerate M. Oersted, Sir Humphry Davy, and professor Barlow, and the latter of these gentlemen has published a very valuable work illustrative of the science.

315. M. Oersted, professor of natural philosophy, and secretary to the Royal Society of Copenhagen, was for many years engaged in enquiries respecting the identity of chemical, electrical, and magnetic forces; and, as early as 1807, proposed to try 'whether electricity the most latent had any action on the magnet.' At that time no experimental proofs of the peculiar opinions he entertained were known; but his constancy in the pursuit of his object, both by reasoning and experiment, was well rewarded in the winter of 1819, by the discovery of a fact of which no previous notice had been taken; but which, when once known, instantly drew the attention of all those who were at all able to appreciate its importance and value.

316. M. Oersted's own account of this discovery has been published in volume xvi. of the

first series of the Annals of Philosophy. It is full of important matter, and contains in few words the results of a great number of observations; and, with his second paper, comprises a very large part of the facts that are as yet known relating to this subject.

317. Upon the excitation of the Voltaic apparatus, by the proper arrangement of its plates and fluid, it is known that certain powers are given to its poles or extremities which enable them, when attached to an electrometer, to show by their divergence a certain tension of electricity; or when connected together by fluids, wires, or other conducting substances, to decompose or heat them. These effects have been known for several years, and are generally attributed to electricity produced by the apparatus; the effects of tension belonging to the insulated state of the poles; those of decomposition and heating to their connected state.

318. When the two poles of such a battery or apparatus are connected by conductors of electricity, the battery is discharged; that is, the tension of the electricity at the poles is lessened, and that, according as the conducting power of the substance is more or less powerful. Good conductors, discharge it entirely and instantly; bad conductors with more or less difficulty; but as the instrument has within itself the power of renewing its first state of tension on the removal of the conducting medium, and that in a very short space of time, it is evident that the connecting substance is continually performing the same office during the whole time of its contact that it did at the first moment, and this whether it be a good or a bad conductor; and it is also evident that it must be in a different state in this situation than when separated from the apparatus. It is important at present rather to consider the action of a good conductor in discharging the battery, as the phenomena to be considered are in that case more energetic. A metallic wire, therefore, may be used to connect the two poles; it will discharge a powerful apparatus; and, consequently, whatever takes place in the connecting medium is here compressed into a very small place. Those who consider electricity as a fluid, or as two fluids, conceive that a current or currents of electricity are passing through the wire, during the whole time it forms the connexion between the poles of an active apparatus. There are many arguments in favor of the materiality of electricity, and but few against it: but still it is only a supposition; and it will be as well to remember, while pursuing the subject of electro-magnetism, that we have no proof of the materiality of electricity, or of the existence of any current through the wire.

319. Whatever be the cause which is active within the connecting wire, whether it be the passage of matter through it, or the induction of a particular state of its parts, it produces certain very extraordinary effects. If small, it becomes heated; and as the size of the wire is diminished, or that of the apparatus increased, the heat rises to an intense degree apparently without any limitation, except from the influence of external circumstances, or the alteration of the wire. Another effect, and it is that to which M. Oersted, here calls attention is, that, if brought towards a magnetic needle, it has the power of attracting and repelling it in a constant manner, and in obedience to certain simple laws.

320. If a magnetic needle be left to take its natural direction, and then a straight portion of the connecting wire be brought above it, and parallel to it, that end of the needle next the negative pole of the battery moves towards the west; and that whether the wire be on the one or the other side of the needle, so that it be above and parallel to it. If the connecting wire be sunk on either side the needle, so as to come into the horizontal plane in which the needle is allowed to move, there is no motion of the needle in that plane; but the needle attempts to move in a vertical circle; and but for the imperfect suspension, and the influence of the earth's magnetism, would do so. When the wire is on the east of the needle, the pole of the needle next the negative end of the battery is elevated; and when on the west of the needle it is depressed. If the connecting wire be now sunk below the level of the needle, similar attractions and repulsions take place, but in opposite directions to those followed when it is above. The pole of the needle opposite the negative end of the battery now moves eastwards, whatever the position of the wire, so that it be restricted as above.

321. That these positions of the magnetic needle may be retained with more facility in the memory, professor Oersted proposed the following formula: 'The pole above which the negative electricity enters is turned to the west; under which, to the east.'

322. M. Oersted subsequently pointed out, what it is easy to see from the above experiments, that the movement of the needle took place in a circle round the connecting wire; and though, in the description of his first experiments, the quantity of declination given to the needle from the wire is expressed by an angle of so many degrees, yet it is afterwards stated to vary with the power of the battery. Whenever the needle is moved in a horizontal or any other circle from the position it naturally assumes, the power of the earth over it tends to restore that position, and is consequently an active force in the present instance opposed to the power of the connecting wire; it therefore lessens the declination the needle would otherwise have. Also when the wire is brought into the same horizontal circle with the needle, its effect over it is shown by the elevation and depression of its opposite ends; and it is the mode of suspension combined with the earth's magnetic power that prevents it from traversing in a vertical circle. But if those interfering circumstances be removed, viz. if the suspension be such as to allow of free motion to the needle in every direction, and the earth's magnetism be rendered null, or counteracted either by the position of the needle, or by the vicinity of another magnet, then a much simpler idea of the relative movements of the wire and needle may be obtained.

323. It is not, perhaps, easy to obtain this perfect state of apparatus, but it is not difficult so to arrange it as to examine the movements first

in one direction, and then in another. It will then be found, if the connecting wires of a sufficiently powerful apparatus be placed near a magnetic needle so as to pass near its centre, that the needle will arrange itself directly across the wire, whatever the previous position of the two; that if the wire be carried round the centre of the needle, or the centre of the needle round the wire, the same relative position of the two will continue; and that the direction of the needle across the wire is not indifferent, but has its poles always in a constant position to the poles of the battery. If the positive pole of a battery be on the right hand, and the negative pole on the left, and a wire be stretched between, connecting them, then a needle above the wire will point the north pole from, and the south towards us; or if below, the south pole from, and the north towards the experimenter. See fig. 5, plate II.

324. If the connecting wire and the needle be represented by two small rods named accordingly, and fastened permanently together, then they will represent the wire and the needle in all positions; for, however one be placed, the other will correspond with it: or if, on the under side of a small square piece of glass, a line be drawn from top to bottom, the upper end being called negative, and the lower positive; and on the upper surface a line be drawn from left to right, the left termination being named south, the right north; then the lower line will always represent the connecting wire, and the upper the needle. Fig. 6.

325. The needle and wire being in this position, if the wire be moved along the needle towards either extremity, strong attractions will take place between it and the pole, notwithstanding the same part of the wire be employed; and the poles in the two positions are contrary to each other. In this case it appears that the same point in the wire has the power of attracting both the north and south pole of the needle. If while the wire is thus situated near the end of the needle, the latter be turned round, so that the pole before there be replaced by the opposite pole, strong repulsions will take place; and that to whichever pole the wire has in the first instance been carried, so that the same point which before attracted both poles will now repel them both. If, when the wire is near the extremity of the needle where the attraction is strongest, it be moved round the end so as to go from one side to the other, keeping the same point constantly towards the needle, its attractive power over the needle will be found to increase as it approaches the end, but remains on one side of it; will diminish as it turns the end; will become null when exactly opposed to the pole; and, as it passes on the other side, will resume repulsive powers, which will be strongest at the extremity of the pole on the opposite side to where the wire was situated at first. Fig. 7.

326. In all these cases the positions assumed by the wire and needle, whether the result of attraction or repulsion, are the same as those before described, except that the wire is now near the end of the needle instead of the middle; and it will be found that all the attractions and repulsions may be reduced to four positions of the needle to the wire, in which it forms tangents with it. In fig. 8, the north pole; in fig. 9, the south pole; if in either of them the poles of the needle be reversed, the tangents remaining in the same direction, repulsion will take place. Hence it is easy to see how any individual part of the wire may be made attractive or repulsive of either pole of the magnetic needle by mere change of position.

327. The magnetic property does not depend upon the metal employed or its form, but is exerted by any of them which forms the circuit between the poles: even a tube filled with mercury is effectual: the only difference is in the quantity of effect produced. It continues also, though the conductor be interrupted by water, unless the interruption be of great extent.

328. The magnetic influence of the wire extends through all sorts of substances, and acts on the needle beyond, just as in common magnetism. It does not act on needles of brass, glass, or gum lac.

329. In a second paper on this subject, M. Oersted shows that not intensity, but quantity, is wanting in the Voltaic apparatus, to produce this effect most eminently. A single galvanic arc is sufficient for the purpose. A plate of zinc, six inches square, placed in a trough of copper, filled with diluted acid, enabled the wire which connected the two metals to act powerfully; and, with a similar arrangement, the zinc plate having a surface of 100 square inches, an effect was produced on the needle at the distance of three feet. He also, in this paper, describes the construction of a Voltaic combination so light, that being suspended, it moved on the approach of a magnet: the motions were in accordance with what has been said, and may easily be conceived.

330. The results obtained by M. Oersted were immediately repeated and confirmed by a great number of philosophers in various places. Of these no one was more active than M. Ampere, in varying experiments, making new ones, and applying to them the most judicious theory.

331. The facts discovered by M. Ampere, though not numerous, are of great importance. He described an experiment, proving that the Voltaic pile itself acted in the same manner as the wire, connecting its two poles; and constructed an instrument which, at the same time that it proved this action, was found to be of great use in experiments on currents of electricity. This was merely a magnetic needle, but from the uses to which it was applied was called a galvanometer. When placed near a pile, or trough, in action, having its poles connected either by a wire, or by introducing them into one cell, it immediately moved, becoming obedient to the battery in the same manner as to the connecting wire; and the motions were such as if the battery were simply a continuation or part of the wire. In consequence of this action, the needle becomes an instrument competent to indicate that state of an active Voltaic pile, and the wire connecting it, which is supposed to be occasioned by currents of electricity, and in which only, magnetism has yet been most perfectly discovered.

332. M. Ampere also announced the fact of the attraction and repulsion of two wires connecting the poles of a battery; and showed, that the magnetic needle, which had previously been used to prove the magnetic attractions and repulsions of the wire, could be replaced by another connecting wire like the first. This discovery seemed to liberate the phenomena of magnetism from any peculiar power resident in the magnet, and to prove its production by electricity alone. When by Oersted's discovery it had been shown that a wire connecting the poles of a Voltaic battery would act on a magnet, attracting and repelling it, just as another magnet would do, it was fair to assume that the wire possessed the powers of the magnet it supplied; and when the second magnet was replaced by another connecting wire, as in Ampere's experiment, and the powers and actions still remained as before, it was perfectly correct to consider these powers and actions as magnetical; so that it became evident that magnetism could be exerted independent of magnets, as they are usually called, and of any of the means of excitation usually employed, but wholly by electricity, and in any good electrically conducting medium.

333. The phenomena with two conductors situate between the poles of the battery are as follows:—When they are parallel to each other, and the same ends of them are similarly related to the battery; viz. when the supposed currents existing in them are in the same direction, then they attract each other; but if the opposite ends be connected with the battery, so that the currents conceived to exist in them are in opposite directions, they repel each other. If also, the one being fixed the other moveable, the currents be sent, or the connexions be made, in opposite directions, then the moveable one will turn round until they are in the same direction. The contrast between these attractions and repulsions, and those usually called electrical, are very striking. The one take place only when the circuit is completed: the other only when it is incomplete. The attractions take place between the similar ends of the wires, and the repulsions between the dissimilar ends; but the electrical attractions take place between dissimilar ends, and the repulsions between similar ends. These take place in vacuo, but those do not. When the magnetic attraction brings the two wires together, they remain in contact; but when electrical attraction brings two bodies together, they separate after the contact.

334. These experiments were varied in several ways by M. Ampere; and the apparatus with which they were made appears, from the plates and description published, to be very delicate, ingenious, and effectual. The general results drawn up by M. Ampere himself from them are, (1.) That two electrical currents attract when they move parallel to each other, and in the same direction; and repel when they move parallel to each other in a contrary direction. (2.) That when the metallic wires, traversed by these currents can only turn in parallel planes, each of the currents tends to direct the other into a situation in which it shall be parallel, and in the same direction. (3.) That these attractions and repulsions are entirely different from the ordinary electrical attractions and repulsions.

335. M. Arago stated to the Royal Academy of Sciences that he had ascertained the attraction of iron filings by the connecting wire of the battery exactly as by a magnet. This fact proved not only that the wire had the power of acting on those bodies already magnetised, but that it was itself capable of developing magnetism in iron that had not previously been magnetised. When the wire in connexion with the poles of the battery was dipped into a heap of filings, it become covered with it, increasing its diameter to the size of a goose-quill; the instant the communication was broken at either pole, the filings dropped off; and when it was re-established, they were re-attracted. This attraction took place with wires of brass, silver, platina, &c., and was so strong as to act on the filings when the wire was brought near them without actual contact. It was shown not to belong to any permanent magnetism in the wire or filings by the inactivity of both when the connexion was not made with the battery; and it was proved not to be electrical attraction by the connecting wire having no power over filings of copper, or brass, or over saw-dust. When soft iron was fused, the magnetism given was only momentary; but on repeating the experiment, with some modification, M. Arago succeeded completely in magnetising a sewing-needle permanently.

336. The theory which M. Ampere had formed, to account for the magnetic phenomena of magnets by electrical powers only, assumed that magnets were only masses of matter, around the axes of which electrical currents were moving in closed curves. This theory led him, when informed by M. Arago of his experiments, to expect a much greater effect if the connecting wire were put into the form of a spiral, and the piece to be magnetised were placed in its axis. According to the theory, in a needle or magnet, pointing to the north, the currents were in the upper part from east to west. In consequence of these expectations, M.M. Ampere and Arago made experiments with spirals or helices, and the results are mentioned in M. Arago's paper, on the communication of magnetism to iron filings in the fifteenth volume of the Annales de Chimie.

337. On twisting a wire round a rod, it may be made to pass either in one direction or the other, giving rise to two distinct but symmetrical helices, which have been named by botanists dextrorsum and sinistrorsum. Though their diameters be equal, and the spirals which compose them have equal inclinations, yet they can never be superposed; for, however they are turned about, their direction is the same. The dextrorsum, or, as we may call it, the right helix, proceeds from the right hand downwards towards the left above the axis; the tendrils of many plants exhibit instances of it, and it is almost exclusively used in the arts: the sinistrorsum, or left helix, proceeds from the left hand downwards towards the right above the axis.

338. Having made some of these helices, one

was connected by its extremities with the poles of a Voltaic battery, and then a needle wrapped in paper placed within it; after remaining there a few minutes, it was taken out, and found to be strongly magnetised; and the effect of a helix above that of a straight connecting wire was found to be very great.

339. Then, with regard to the position of the poles in the magnetised needle, it was found that, whenever a right helix was used, that end of the needle towards the negative end of the battery pointed to the north, and that towards the positive end toward the south; but that with a left helix, that end of the needle towards the positive, pointed north; and the other end south.

340. In order to establish this point, the connecting wire was sometimes formed into one helix, sometimes into two or three, which was readily done by twisting it round a glass tube, or rod, first in one direction, then in another; and when needles previously enclosed in glass tubes were then placed in these helices, the magnetic poles they received were always in accordance with the statement just given. In one case, also, where the connecting wire had been formed into three consecutive helices, the middle one being of course different to the other two, a single piece of steel wire sufficiently long to pass through all three of them being enclosed in a glass tube was placed within them. On being again removed and examined, it was found to have six poles; first, a north pole, a little further on a south pole, then another south pole, a north pole, another north pole, and at the further end a south pole.

341. M. Boisgeraud read a paper to the Royal Academy of Sciences, containing the detail of numerous experiments, most of which, however, are variations of Oersted's first experiments. He remarked, that connecting wires, or arcs, placed any where in the battery, would affect the needle, a result that follows as a consequence from Oersted's and Ampere's experiments. He notices the difference of intensity in the effects produced when bad electrical conductors were employed to complete the circuit, a difference which Oersted himself had pointed out in the case of water. M. Boisgeraud, however, proposed to ascertain the conducting power of different substances by placing them in one of the arcs, cells, or divisions of the battery, and bringing the magnetic needle, or Ampere's galvanometer, towards another arc, viz. to the wire, or other connecting body, used to complete the circuit in the battery. With regard to the positions, M. Boisgeraud's notices of the needle and wire, they are all confirmatory of Oersted's statements.

342. M. Ampere read another memoir on the phenomena of the Voltaic pile, and on the method he intended to pursue in calculating the action of two electrical currents. He also showed the mutual action of two rectilinear electrical currents; viz. of two straight portions of the connecting wires; for it appears that the phenomena of attraction, repulsion, &c., were first observed with spiral wires. These actions, however, are exactly similar; and the view already given of them, as it relates to straight wires, is consequently more simple than the description of the effects with spiral wires can be; viz. considering it as a matter of experiment only, and not of theory.

343. In consequence of the view which M. Ampere had taken of the nature of magnetism as dependent simply upon currents of electricity, it became an important object with him to ascertain the action of the earth upon such currents excited by the Voltaic battery; for, from his theory, he expected that it would be equally efficient in directing these currents as in directing those supposed to exist in the magnetic needle. After some trials, he succeeded in overcoming the obstacles to delicate suspension, contact, &c., and constructed an apparatus in which a part of the wire connecting the two poles of a battery was rendered so light and mobile as to move immediately; the connexion was completed with the pole, and took a direction which, with regard to the earth, was always constant, and in accordance with M. Ampere's theory. An account of these experiments, with the apparatus used in them, was read to the Royal Academy. The first consisted of a wire bent so as to form almost a complete circle of about sixteen inches in diameter; the two extremities were made to approach, and were placed one just beneath the other; and being attached to two steel points, were connected by them with two little basins of platina containing mercury, fixed so as to receive them; only one of the points touched the bottom of the cup in which it was placed; so that the friction was scarcely any, and the mercury secured a good contact. The cups were connected with other wires that passed off to the Voltaic battery; so that it was easy to make this moveable circle connect either one way or the other between the poles; and being enclosed in a glass case, any movement it might receive was readily observed without danger of its resulting from any other cause than the electric action.

344. When the extremities of this apparatus were connected with the poles of a battery, the circle immediately moved, and after some oscillations placed itself in a plane perpendicular to the magnetic meridian of the earth; and, on every repetition of the experiments, the same effect took place. The direction in which it moved depended upon the way in which the connexion had been made with the battery; and if it be assumed that there is a current passing through the wire, from the positive to the negative end, the curve so arranged itself that that current always passed downwards on the eastern side, and upwards on the west. This circle moved round a perpendicular, and, therefore, only represented the direction of the magnetic needle: in order to represent the dip, a wire was formed into a parallelogram, and being fixed to a glass axis was suspended by fine points, and connected as before, so as to move round a horizontal axis, then this axis being placed perpendicular to the magnetic meridian, and the wires being connected with the poles of a battery, the parallelogram immediately moved towards a position in the plane perpendicular to the dipping-needle; when the communication was broken, it returned towards its first position; and when renewed, it resumed the second, evidently indicating the

magnetic influence of the earth over it. In consequence of the difficulty of placing the centre of gravity in the centre of suspension, and keeping it there, this conductor did not take its position exactly in a plane perpendicular to the dipping needle, but approached towards it till in equilibrium between the magnetic and the gravitating power of the earth.

345. M.M. Biot and Savart read a memoir to the Academy of Sciences, the object of which was to determine the law by which a connecting wire acted on magnetised bodies. Small rectangular plates, or cylindrical wires, of tempered steel, were made magnetical by the double touch, and being then suspended by silk-worm threads were placed in differed positions with, and at different distances from, the wire connecting the poles of the battery. The terrestrial magnetism was sometimes combined with that of the wire, sometimes opposed to it, and sometimes neutralised by the vicinity of another magnet. The different positions of equilibrium, and the number of oscillations of the needles, were then observed, and data gained, by which M.M. Biot and Savart were conducted to the following result, which expresses the action exerted by a molecule of austral or boreal magnetism, placed at any distance from a very fine and indefinite cylindrical wire, rendered magnetic by the Voltaic current. Let a line pass from this molecule perpendicularly to the axis of the wire, the force which draws the molecule is perpendicular to this line and to the axis of the wire; its intensity is reciprocal to the distance. The nature of the action is the same as that of a magnetised needle placed on the surface of the wire in a direction determinate and constant in its relation to the direction of the Voltaic current; so that a molecule of boreal magnetism, and a molecule of austral magnetism, would be drawn in different directions, though constantly according to the preceding expression.

346. M. Ampere noticed an effect produced by the connecting wire bent into a helix. This may be easily understood from considering that the direction of the magnetic power is always perpendicular to the conducting wire. When, therefore, the conducting wire is parallel to the axis of the helix, the power is perpendicular to that axis; when the wire forms a circle round the axis, in a plane perpendicular to it, the power is in the direction of the axis; but when, as in the helix, it passes round the axis in a direction intermediate between parallelism and perpendicularity, the direction of the power is of course inclined accordingly. In this case the power may be considered as composed of two portions, one perpendicular to the axis, the other parallel to it. As M. Ampere considered magnets to be assemblages of currents perpendicular to their axes, he wished, in his imitation of them, to do away with that effect due to the extension of the wire in the direction of the axis of the helix, and succeeded in this by making the wire at one end return through the helix so as not to touch it in any part; for, in this position, its magnetic effects being contrary to those belonging to the length of the helix, and also near to them, they neutralised and void each other. An imitation of a magnet was made by forming a helix, and making the wires at the two extremities return through the centre of the helix half way, and then pass out upwards and downwards, so as to form a perpendicular axis on which the whole might move. The extremity of a battery being connected with these two ends of the wire, the helix became magnetical, and was attracted and repelled by a magnet precisely as a real magnet would have been.

347. M. Biot's examination of the effects of magnetism, as impressed by electricity in motion, is too excellent to be passed unnoticed in our chronological account of discoveries in this science.

348. 'When the electric current, evolved from a Voltaic battery, is transmitted through any metallic bodies whatsoever, it gives them instantaneously a magnetic virtue; they become then capable of attracting soft and unmagnetised iron. This curious fact was discovered by M. Oersted. If we expose to these metallic bodies, a magnetic needle, they attract one of its poles, and repel the other, but only relative to the parts of their surface to which the needle is presented. Needles of silver or copper are not affected, but merely those susceptible of being magnetised. These effects subsist only under the influence of the electrical current. If we suspend the circulation of the electricity, by breaking off the communications established between the opposite poles of the Voltaic apparatus, or even if we retard considerably its velocity, by joining its poles with bad conductors, the magnetic power instantly ceases, and the bodies which had received it return to their usual state of indifference.

349. 'This simple sketch already displays many new properties. All the processes hitherto employed to magnetise bodies had produced an effect on only three pure metals, iron, nickel, and cobalt, and on some of their compounds, steel for example, which is merely a carburet of iron. Till now it was never possible to render silver, copper, or the rest of the metals magnetic. But the electric current gives all of them this property; it bestows it transiently by its presence; and, as we shall presently see, it diffuses it through the whole mass, in a manner equally singular, and which has no resemblance to what is produced, when we develope magnetism by our ordinary processes, which consist in longitudinal friction with magnetic bars.

350. 'To produce these novel phenomena in the simplest manner, we must, with M. Oersted, establish a communication between the two extremities of the Voltaic apparatus, by a simple metallic wire, which may be easily directed and bent in all directions. We place afterwards, in the neighbourhood of the battery, a very sensible magnetic needle, horizontally suspended. As soon as this is settled in the direction due to the magnetic force of the terrestrial globe, we take a flexible portion of the conducting, or conjunctive wire, as M. Oersted calls it, and having stretched it parallel to the needle, we bring it gently near it, either from above, from below, from the right, or from the left. We shall see an immediate deviation of the needle; but, what is not the least remarkable circumstance, the direction of this

deviation differs according to the side by which the conjunctive wire approaches it. Duly to comprehend this astonishing phenomenon, and to fix its peculiarities with precision, let us suppose that the conjunctive wire is extended horizontally from north to south, in the very direction of the magnetic direction in which the needle reposed, and let the north extremity be attached to the copper pole of the trough, the other being fixed to the zinc pole. Imagine, also, that the person who makes the experiment looks northward, and consequently towards the copper or negative pole. In this position of things, when the wire is placed above the needle, the north pole of the magnet moves towards the west; when the wire is placed underneath, the north pole moves towards the east; and, if we carry the wire to the right or the left, the needle has no longer any lateral deviation, but it loses its horizontality. If the wire be placed to the right hand, the north pole rises; to the left, its north pole dips; and in thus transporting the conjunctive wire all around the needle, in directions parallel to one another, we merely present it to the needle, by the different sides of its circular contour, without affecting in the least the proper tendency of the needle towards the terrestrial magnetic poles. Since then the deviations observed in these successive positions are first of all directed from right to left, when the wire is above the needle; then from above downwards, when the wire is to the left; from the left to the right, when the wire is beneath; and, finally, from below upwards when it is to the right hand, we must necessarily conclude from these effects, that the wire deranges the needle, by a force emanating from itself, a force directed transversely to the length of its axis, and always parallel to the portion of its circular contour, to which the needle is opposite. M. Oersted drew this inference from his first observations.

351. 'Now this revolutive character of the force, and revolutive according to a determinate direction, in a medium which like silver, copper, or other pure metal, seems perfectly identical in all its parts, is a phenomenon very remarkable, of which we had heretofore only one singular example in the deviations which certain bodies impress on the planes of polarisation of the luminous rays. The first fact of the magnetism, transiently impressed upon the conjunctive wire by the Voltaic current, might have offered itself to a vulgar observer. I do not know whether some traces of this property may not have been previously perceived and indicated; but to have recognised this peculiar character of the force, and to have delineated it, agreeably to its phenomena, without hesitation and uncertainty, is the praise which truly belongs to M. Oersted, and which constitutes a condition entirely new in the movement of electricity.

352. 'As soon as this beautiful discovery was known in France, England, and Germany, it excited the most lively sensation among men of science. One of our colleagues, in particular, M. Ampere, ardently verified it in all its circumstances. Seizing with sagacity the revolutive character of the force impressed on the conjunctive wire, he directed it with judgment, and skilfully developed the consequences which flowed from this property. His researches, which preceded those of the other French philosophers, have considerably occupied the Academy; but as the order of exposition, occasioned by the mutual dependence of the phenomena, hinders me from beginning with them, I have endeavoured to compensate for this inversion by rendering justice at once, to labors which have anticipated and facilitated others.

353. 'In the above experiments which M. Oersted had made, the conjunctive wire is presented to steel needles, previously magnetised. It may be asked, if the action then exercised is proper to the conjunctive wire, as the action of a bar of steel tempered and magnetised is proper to this bar, or if the action is communicated to the wire by the presence of the magnetic needle, as we see soft iron, which exercises no magnetic power of itself, acquire transiently this power in the presence of magnets? To decide this question it was necessary to examine whether a body, not magnetic in itself, but capable of becoming so by influence, soft iron for example, would experience a sensible action at the approach of a conjunctive wire, traversed by the Voltaic current. This was effected by M. Arago, who showed that filings of iron are attracted by these wires; a simple but important fact, which defines clearly one of the characters of the force by which the phenomenon is produced.

354. 'The first thing which we must determine, is the law according to which the force emanating from the conjunctive wire decreases at different distances from its axis. This enquiry has been the object of experiments which I made along with M. Savart, already known to the Academy by his ingenious discoveries in acoustics. We took a small needle of magnetised steel in the form of a parallelogram, and, to ensure its perfect mobility, we suspended it under a glass bell, by a single fibre of the silkworm, and gave it at the same time a horizontal direction. Then, in order that it might be entirely at liberty to obey the force emanating from the conjunctive wire, we screened it from the action of the magnetism of the earth, by placing a magnetised bar at such a distance, and in such a direction, that it exactly balanced this action. Our needle was thereby placed in the same freedom of movement as if there did not exist any terrestrial globe, or as if we had been able to transport ourselves with it to a great distance in space. We now presented it to a conjunctive cylindrical wire of copper, stretched in a vertical direction, and to which we had given such a length, that its extremities necessarily bent in order to attach them to the poles of the electric apparatus, should have, in consequence of their distance, so feeble an action on the needle that it might be neglected with impunity. This disposition represented therefore the effect of an indefinite vertical wire, acting on a horizontal and independent magnetic needle. As soon as the communication of the Voltaic current was completed, the needle turned transversely to the axis of the wire, conformably to the revolutive character indicated by M. Oersted; and it set itself to oscillate around this direction, as a

clock pendulum, moved from the perpendicular, oscillates round the vertical by the effect of gravitation. We counted with an excellent seconds watch of M. Breguet, the time in which a certain number of these oscillations, twenty for example, were performed; and by repeating this observation, when the wire and needle were at different distances, we inferred the decreasing intensity of the force, precisely as we determined, by the oscillations of the same pendulum, the variations of gravity at different latitudes. We thus found that the force exercised by the wire was transverse to its length, and revolution, as M. Oersted had observed; but we discovered besides that it decreased in a ratio exactly proportional to the distance. However, the force which we thus observed was in reality a compound result; for on dividing in imagination the whole length of the conjunctive wire, into an infinity of segments of a very small altitude, we perceive that each segment ought to act on the needle, with a different energy according to its distance and direction. Now these elementary forces are precisely the simple result which it is important to know; for the total force, exercised by the whole wire, is merely the sum of their actions. Calculation enables us to pass from this resultant to the simple action. This has been done by M. Laplace. He has deduced, from our observations, that the individual law of the elementary forces, exercised by each section of the conjunctive wire, was the inverse ratio of the square of the distance; that is, precisely the same that we know to exist in ordinary magnetic actions. This analysis showed that, in order to complete the knowledge of the force, it remained to determine if the action of each section of the wire was the same, at an equal distance, in all directions; or if it was more energetic in a certain direction than in others. I have assured myself by delicate experiments that the last is the case.

355. 'What we now know of the law of the forces, is sufficient for explaining and connecting together a multitude of results, of which I now proceed to indicate briefly some of the most curious. For example, let us conceive as we have done above, an indefinite conjunctive wire, stretched horizontally from south to north. Let us present laterally to it a magnetic needle, of a cylindrical shape, and suspended so that it can take no movement but in the horizontal direction. For greater simplicity, let us withdraw it from the influence of the terrestrial magnetism, by neutralising this influence with the action of a magnet suitably placed. This being done, when the needle rests at the same height as the wire, so as to point exactly to its axis, it is neither attracted nor repelled; but, if we raise it above the wire, it presents one of its poles to it, and makes an effort of approximation. If, on the contrary, we sink it below, the needle turns about, to present its other pole, and is then attracted anew. But, if we constrain it to present the same pole as at first, the needle is repelled, and the effects are precisely inverse on the right and on the left hand of the wire.

356. 'If, instead of transmitting the electrical current across a simple wire, we make it pass through tubes, plates, or other bodies of a sensible breadth, whose surfaces are composed of parallel right lines, we find that all these bodies act on the magnetic needle, as bundles of wires parallel to their length would do; which proves that the power developed in them by the electrical current is exerted freely through their very substance, and is not weakened by their interposition, as the radiation of heat through hot bodies is enfeebled and intercepted by the interposition of these very bodies.

357. 'Instead of leaving the needle in the preceding experiment at liberty to move, fix it invariably, but render the conjunctive wire moveable, by suspending it on two points; then it will be the latter which will move towards the needle, or recede from it. In fact, it is a general law of mechanics, that re-action is always equal to action. If the wire attract or repel the needle in certain circumstances, the needle ought in the same circumstances to attract or repel the wire. This experiment belongs to M. Ampere.

358. 'Now, let us operate no longer with a magnetic needle on the wire placed in its position of mobility, but let us expose it to the magnetic action of the terrestrial globe, which is known to be perfectly similar to that of a common magnet whose poles are very distant. This force will likewise make the conjunctive wire move according to the same laws, at least if it be sufficiently freely suspended, and it will impress on it a determinate direction relative to the plane of the meridian, just as it would direct any other magnetic body. This result was realised by M. Ampere.

359. 'Finally, instead of presenting a conjunctive wire to a magnet, present two conjunctive wires to one another, in parallel positions. Then if the revolutive direction of the force be the same for the two wires, they will both concur in giving one direction to a magnetic needle placed between them; but, if the direction of the revolutive movement be opposite in each, they will tend to turn the needle in opposite directions. These are simple consequences of the law of the forces. Now, on trying these two arrangements, M. Ampere has found that in the first the two wires come together, and that in the second they mutually repel each other. Thence we must make two inferences; first, that the wires exert on each other actions perfectly analogous to those which they exercise on magnetic needles; and next that the distribution of these forces in each of their particles is analogous as to direction, with what it is in magnetic needles themselves. These two new conditions relative to the nature of the force, render this experiment very important.

360. 'In the different arrangements which we have just described, the conjunctive wires and the magnets attract or repel principally by their most contiguous parts; for, with regard to the rest, their distance rapidly diminishes their action. Hence it is evident that we should augment the energy of the effects, if we approximate together the different parts of the conjunctive wire, preserving to them, however, the same general line of action. M. Ampere has also verified this position, by coiling the conjunctive wire in the form of a flattened spiral, on the

plane of whose contours he acts with magnets, as on the side of a single wire.

361. 'Among the arrangements which he has thus formed, one of the most remarkable consists in winding the conjunctive wire around a cylinder of wood or glass, forming an elongated spiral. Then the force emanating from each point of the thread, being always directed transversely to its length, becomes in each element of the spiral perpendicular to the place of the coils, and consequently parallel to the length of the spiral itself. Farther, on account of the revolutive character of the force, all the inner points of the different rings exercise, in the interior of tne spiral, forces which are equal, and operate in the same direction: whilst in their action exteriorly, the forces emanating from the different points of each ring, oppose and weaken each other gently by their obliquity. Thus the result of all these actions ought to be much more energetic within the spiral than outside of it; a consequence which actually happens. If we place in the interior of a spiral, unmagnetic steel needles, they will acquire in a few instants a permanent and very perceptible longitudinal magnetism; whereas, if we place them without the spiral, they suffer no change. This experiment is due to M. Arago. Sir H. Davy, without being acquainted with it, has since succeeded in magnetising small steel needles, by rubbing them transversely on a single conjunctive wire, or even without contact, by placing them at some distance from it. This process does not differ from the preceding, except in using the force of only one wire, a force which the spiral multiplies.

362. 'Since the electricity developed by the friction of our ordinary machines, differs in no other respect from that evolved from the Voltaic apparatus, than that the former is retained and fixed, while the latter is in motion; we find that, whenever we cause the electricity of our machines to flow in a continuous current, it has produced absolutely the same effects as the Voltaic battery. The similarity, or rather the identity, of these two forms of electricity, is manifested likewise in the production of the electro-magnetic phenomena. This has been shown by M. Arago, who transmitted along the spirals of M. Ampere, no longer the Voltaic current, but a succession of very small sparks, drawn from a common electrical machine. Small steel needles, placed in the interior of these spirals, were thus magnetised in a few instants, and the direction of their magnetic polarity was found to be determined in reference to the surfaces charged with the resinous or vitreous electricity, precisely as happens with the copper and zinc poles of the Voltaic apparatus.'

363. We must now revert to the discoveries that were rapidly proceeding in this country. Sir Humphry Davy found, in repeating the experiments of M. Oersted with a Voltaic apparatus of 100 pairs of plates of four inches, that the south pole of a common magnetic needle placed under the communicating wire of platinum was strongly attracted by the wire, and remained in contact with it, so as entirely to alter the direction of the needle, and to overcome the magnetism of the earth. This he could only explain by supposing that the wire itself became magnetic during the passage of the electricity through it, and direct experiments, which were immediately made, proved that this was the case. He threw some iron filings on a paper, and brought them near the communicating wire, when immediately they were attracted by the wire, and adhered to it in considerable quantities, forming a mass round it ten or twelve times the thickness of the wire: on breaking the communication they instantly fell off, proving that the magnetic effect depended entirely on the passage of the electricity through the wire. The same experiment was tried on different parts of the wire, which was seven or eight feet in length, and about the twentieth of an inch in diameter, and the iron filings were found every where attracted by it; and, making the communication with wires between different parts of the battery, iron filings were attracted, and the magnetic needle affected in every part of the circuit.

364. It was easy to imagine that such magnetic effects could not be exhibited by the electrified wire without being capable of permanent communication to steel. Sir Humphry fastened several steel needles, in different directions, by fine silver wire to a wire of the same metal, of about the thirtieth of an inch in thickness, and eleven inches long, some parallel, others transverse, above and below in different directions; and placed them in the electrical circuit of a battery of thirty pairs of plates, of nine inches by five, and tried their magnetism by means of iron filings: they were all magnetic; those which were parallel to the wire attracted filings in the same way as the wire itself, but those in transverse directions exhibited each two poles, which, being examined by the test of delicate magnets, it was found that all the needles that were placed under the wire (the positive end of the battery being east) had their north poles on the south side of the wire, and their south poles on the north side; and that those placed over had their south poles turned to the south, and their north poles turned to the north; and this was the case whatever was the inclination of the needles to the horizon. On breaking the connexion, all the steel needles that were on the wire in a transverse direction retained their magnetism, which was as powerful as ever, while those which were parallel to the silver wire appeared to lose it at the same time as the wire itself.

365. He attached small longitudinal portions of wires of platinum, silver, tin, iron, and steel, in transverse directions, to a wire of platinum that was placed in the circuit of the same battery. The steel and the iron wire immediately acquired poles in the same manner as in the last experiment; the other wires seemed to have no effect, except in acting merely as parts of the electrical circuit; the steel retained its magnetism as powerfully after the circuit was broken as before; the iron wire immediately lost a part of its polarity, and in a very short time the whole of it.

366. The battery was placed in different directions as to the poles of the earth; but the effect was uniformly the same. All needles placed transversely under the communicating

wires, the positive end being on the right hand, had their north poles turned toward the face of the operator, and those above the wire their south poles; and on turning the wire round to the other side of the battery, it being in a longitudinal direction, and marking the side of the wire, the same side was always found to possess the same magnetism; so that in all arrangements of needles transversely round the wire, all the needles above had north and south poles opposite to those below, and those arranged vertically on one side, opposite to those arranged vertically on the other side.

367. It was found that contact of the steel needles was not necessary, and that the effect was produced instantaneously by the mere juxtaposition of the needle in a transverse direction, and that through very thick plates of glass: and a needle that had been placed in a transverse direction to the wire merely for an instant, was found as powerful a magnet as one that had been long in communication with it.

368. Sir Humphry placed some silver wire of one-twentieth of an inch, and some of one-fiftieth, in different parts of the Voltaic circuit when it was completed, and shook some steel filings on a glass plate above them: the steel filings arranged themselves in right lines, always at right angles to the axis of the wire; the effect was observed, though feebly, at the distance of a quarter of an inch above the thin wire, and the arrangement in lines was nearly to the same length on each side of the wire.

369. He ascertained, by several experiments, that the effect was proportional to the quantity of electricity passing through a given space, without any relation to the metal transmitting it: thus, the finer the wires the stronger their magnetism.

370. A zinc plate of a foot long, and six inches wide, arranged with a copper plate on each side, was connected by a very fine wire of platinum; and the plates were plunged an inch deep in diluted nitric acid. The wire did not sensibly attract fine steel filings. When they were plunged two inches, the effect was sensible; and it increased with the quantity of immersion. Two arrangements of this kind acted more powerfully than one; but when the two were combined, so as to make the zinc and copper plates but parts of one combination, the effect was very much greater. This was shown still more distinctly in the following experiment:—Sixty zinc plates with double copper plates were arranged in alternate order, and the quantity of iron filings which a wire of a determinate thickness took up observed: the wire remaining the same, they were arranged so as to make a series of thirty; the magnetic effect appeared more than twice as great; that is, the wire raised more than double the quantity of iron filings.

371. The magnetism produced by Voltaic electricity seems (the wire transmitting it remaining the same) exactly in the same ratio as the heat; and however great the heat of a wire, its magnetic powers were not impaired. This was distinctly shown in transmitting the electricity of twelve batteries of ten plates each of zinc, with double copper arranged as three, through fine platinum wire, which, when so intensely ignited as to be near the point of fusion, exhibited the strongest magnetic effects, and attracted large quantities of iron filings, and even small steel needles from a considerable distance.

372. As the discharge of a considerable quantity of electricity through a wire seemed necessary to produce magnetism, it appeared probable that a wire electrified by the common machine would not occasion a sensible effect; and this was found to be the case, on placing very small needles across a fine wire, connected with a prime conductor of a powerful machine and the earth. But, as a momentary exposure in a powerful electrical circuit was sufficient to give permanent polarity to steel, it appeared equally obvious, that needles placed transversely to a wire at the time that the electricity of a common Leyden battery was discharged through it, ought to become magnetic, and this was actually the case, and according to precisely the same laws as in the Voltaic circuit; the needle under the wire, the positive conductor being on the right hand, offering its north pole to the face of the operator, and the needle above exhibiting the opposite polarity.

373. So powerful was the magnetism produced by the discharge of an electrical battery of seventeen square feet, highly charged, through a silver wire of one-twentieth of an inch, that it rendered bars of steel two inches long, and from one-twentieth to one-tenth in thickness, so magnetic, as to enable them to attract small pieces of steel wire or needles; and the effect was communicated to a distance of five inches above or below, or laterally from the wire, through water, or thick plates of glass, or metal electrically insulated.

374. The facility with which experiments were made with the common Leyden battery, enabled Sir Humphry Davy to ascertain several circumstances which were easy to imagine, such as that a tube filled with sulphuric acid, of one-fourth of an inch in diameter, did not transmit sufficient electricity to render steel magnetic; that a needle placed transverse to the explosion through air, was less magnetised than when the electricity was passed through wire; that steel bars exhibited no polarity (at least at their extremities) when the discharge was made through them, as part of the circuit, or when they were placed parallel to the discharging wire; that two bars of steel fastened together, and having the discharging-wire placed through their common centre of gravity, showed little or no signs of magnetism after the discharge, till they were separated, when they exhibited their north and south poles opposite to each other, according to the law of position.

375. These experiments distinctly showed, that magnetism was produced whenever concentrated electricity passed through space; but the precise circumstances, or law of its production, were not obvious from them. When a magnet is made to act on steel filings, these filings arrange themselves in curves round the poles, but diverge in right lines; and in their adherence to each other form right lines, appearing as spicula. In the attraction of the filings round the

wire in the Voltaic circuit, on the contrary, they form one coherent mass, which would probably be perfectly cylindrical, were it not for the influence of gravity. In first considering the subject, it appeared to Sir Humphry, that there must be as many double poles as there could be imagined points of contact round the wire; but when he found the north and south poles of a needle uniformly attracted by the same quarters of the wire, it appeared to him that there must be four principal poles corresponding to these four quarters. Dr. Wollaston has, however, pointed out that there is nothing definite in the poles; that the phenomena may be explained, by supposing a kind of revolution of magnetism round the wire, depending for its direction upon the position of the negative and positive sides of the electrical apparatus.

376. To gain some light upon this matter, and to ascertain correctly the relations of the north and south poles of steel, magnetised by electricity to the positive and negative state, Sir Humphry Davy placed short steel needles round a circle made on pasteboard, of about two inches and a half in diameter, bringing them near each other, though not in contact; and fastening them to the pasteboard by thread, so that they formed the sides of a hexagon inscribed within the circle. A wire was fixed in the centre of this circle, so that the circle was parallel to the horizon, and an electric shock was passed through the wire, its upper part being connected with the positive side of a battery, and its lower part with the negative. After the shock all the wires were found magnetic, and each had two poles; the south pole being opposite to the north pole of the wire next to it, and vice versa; and when the north pole of a needle was touched with a wire, and that wire moved round the circle to the south pole of the same needle, its motion was opposite to that of the apparent motion of the sun.

377. A similar experiment was tried with six needles arranged in the same manner, with only this difference, that the wire positively electrified was below. In this case the results were precisely the same, except that the poles were reversed; and any body, moved in the circle from the north to the south pole of the same needle, had its direction from east to west.

378. A number of needles were arranged as polygons in different circles round the same piece of pasteboard, and made magnetic by electricity; and it was found that in all of them, whatever was the direction of the pasteboard, whether horizontal or perpendicular, or inclined to the horizon, and whatever was the direction of the wire with respect to the magnetic meridian, the same law prevailed; for instance, when the positive wire was east, and a body was moved round the circle from the north to the south poles of the same wire, its motion (beginning with the lower part of the circle) was from north to south, or with the upper part from south to north; and when the needles were arranged round a cylinder of pasteboard so as to cross the wire, and a pencil-mark drawn in the direction of the poles, it formed a spiral.

379. It was perfectly evident from these experiments, that as many polar arrangements may be formed as chords can be drawn in circles surrounding the wire.

380. Supposing powerful electricity to be passed through two, three, four, or more wires, forming part of the same circuit parallel to each other in the same plane, or in different planes, it could hardly be doubted that each wire, and the space around it would become magnetic in the same manner as a single wire, though in a less degree; and this was found to be actually the case. When four wires of fine platinum were made to complete a powerful Voltaic circuit, each wire exhibited its magnetism in the same manner, and steel filings on the sides of the wires opposite attracted each other.

381. As the filings on the opposite sides of the wire attracted each other in consequence of their being in opposite magnetic states, it was evident, that if the similar sides could be brought in contact, steel filings upon them would repel each other. This was very easily tried with two Voltaic batteries, arranged parallel to each other, so that the positive end of one was opposite to the negative end of the other. steel filings upon two wires of platinum joining the extremities strongly repelled each other. When the batteries were arranged in the same order, viz. positive opposite to positive, they attracted each other; and wires of platinum (without filings) and fine steel wire (still more strongly) exhibited similar phenomena of attraction and repulsion under the same circumstances.

382. As bodies magnetised by electricity put a needle in motion, it was natural to infer that a magnet would put bodies magnetised by electricity in motion, and this was found to be the case. Some pieces of wire of platinum, silver, and copper were placed separately upon two knife edges of platinum, connected with two ends of a powerful Voltaic battery, and a magnet presented to them; they were all made to roll along the knife edges, being attracted when the north pole of the magnet was presented, the positive side of the battery being on the right hand, and repelled when it was on the left hand, and vice versa, changing the pole of the magnet. Some folds of gold leaf were placed across the same apparatus, and the north pole of a powerful magnet held opposite to them; the folds approached the magnet, but did not adhere to it. On the south pole being presented, they receded from it.

383. Sir Humphry Davy, in continuing his researches on the magnetic phenomena produced by electricity, found that these phenomena were precisely the same, whether the electricity was small in quantity, and passing through good conductors of considerable magnitude; or, whether the conductors were so imperfect as to convey only a small quantity of electricity; and in both cases they were neither attractive of each other, nor of iron filings, and not affected by the magnet, and the only proof of their being magnetic was their occasioning a certain small deviation of the magnetised needle.

384. Thus, a large piece of charcoal placed in the circuit of a very powerful battery, being a very bad conductor compared with the metals,

would not affect the compass needle at all, unless it had a very large contact with the metallic part of the circuit; and if a small wire was made to touch it in the circuit, only in a few points, that wire did not gain the power of attracting iron filings; though, when it was made to touch a surface of platinum foil coiled round the end of the charcoal, a slight effect of this kind was produced. And in a similar manner fused hydrate of potassa, one of the best of the imperfect conductors, could never be made to exert any attractive force on iron filings, nor could the smallest filaments of cotton, moistened by a solution of hydrate of potassa, placed in the circuit, be made to move by the magnet; nor did steel needles floating on cork on an electrised solution of this kind, placed in the Voltaic circuit, gain any polarity; and the only proof of the magnetic powers of electricity passing through such a fluid, was afforded by its effect upon the magnetised needle, when the metallic surfaces, plunged in the fluid, were of considerable extent. That the mobility of the parts of fluids did not interfere with their magnetic powers, as developed by electricity, was proved by electrifying mercury and Newton's metal fused in small tubes. These tubes, placed in a proper Voltaic circuit, attracted iron filings, and gave magnetic powers to needles; nor did any agitation of the mercury or metal within, either in consequence of mechanical motion or heat, alter or suspend their polarity.

385. Imperfect conducting fluids do not give polarity to steel when electricity is passed through them; but electricity passed through air produces this effect. Reasoning on this phenomenon, and on the extreme mobility of the particles of air, Sir Humphry Davy concluded, as M. Drago had likewise done from other considerations, that the Voltaic current in air would be affected by the magnet.

386. Mr. Pepys charged the great battery of the London Institution, consisting of 2000 double plates of zinc and copper, with a mixture of 1168 parts of water, 108 parts of nitrous acid, and twenty-five parts of sulphuric acid; the poles were connected by charcoal, so as to make an arc, or column of electrical light, varying in length from one to four inches, according to the state of rarefaction of the atmosphere in which it was produced; and a powerful magnet being presented to this arc, or column, having its pole at a very acute angle to it, the arc, or column, was attracted or repelled with a rotatory motion, or made to revolve by placing the poles in different positions, being repelled when the negative pole was on the right hand, by the north pole of the magnet, and attracted by the south pole, and vice versa.

387. It was proved by several experiments that the motion depended entirely upon the magnetism, and not upon the electrical inductive powers of the magnet; for masses of soft iron, or of other metals, produced no effect.

388. The electrical arc, or column of flame, was more easily affected by the magnet, and its motion was more rapid when it passed through dense than through rarefied air, and in this case, the conducting medium or chain of aeriform particles was much shorter.

389. We must now again revert to the continental philosophers. M. Von Buch, of Utrecht, while engaged in repeating the experiments of Oersted and others, obtained results according with them, except in one instance of difference with Oersted. M. Oersted says, that 'if the uniting wire be placed perpendicularly to the plane of the magnetic meridian, whether above or below it, the needle remains at rest, unless it be very near the pole; in that case, the pole is elevated when the entrance is from the west side of the wire, and depressed when from the east.' M. Von Buch points out that this state of rest does not continue in two of the four positions of the wire. When the connecting wire is beneath the centre of the needle, and the positive current is from east to west, the needle remains unmoved. When the current is from west to east, it performs half a revolution. On the contrary, the connecting wire being above the current from east to west, makes the needle turn half way round; while that from west to east leaves the needle unmoved. M. Von Buch conceives the difference of his results and M. Oersted's to depend upon the superior power of his apparatus; and indeed it is sufficiently evident that the incompleteness of Mr. Oersted's results depended upon the weakness of his pile. The attractions and repulsions, or the elevations and depressions, he speaks of when the wire was brought near the poles proves the existence of that action which, in M. Von Buch's experiments, was strong enough to turn the needle round; and, if the position of the wire and needle in these experiments be compared with the positions deduced from M. Oersted's experiments, it will be found that, in two of the cases, those pointed out by M. Von Buch, it was necessary a half revolution of the needle should take place to bring it into a state of equilibrium with the wire in those positions.

390. M. Von Buch, also, appears to have ascertained the effect of common electricity in producing magnetism without a previous knowledge of what had been done by others in that way, and succeeded in producing the effect by a smaller power than had before been used for that purpose. He found that a strong discharge was not necessary, nor even a Leyden phial; but, fixing a helix between the prime conductor of a machine and another insulated conductor, placing a steel needle in it, and then drawing sparks from the latter conductor, the needle became magnetic. One single turn of a machine, with two discs, eighteen inches in diameter, was sufficient to make the needle evidently magnetic.

391. In Italy, many experiments relating to magnetism by electricity had been made, and which, though new at the time to those who made them, had been previously made by others. A series was made by M.M. Gazzeri, Ridolfi, and Antinori, at Florence. The results are as follows: needles placed in helices connected with the poles of the battery received their full magnetisation in one minute. Needles on the outside of the helices would receive no magne-

tism, unless there was one or more also within, and then they became magnets with their poles in opposite directions to the poles of the inner magnet. The helix was changed into a square form, by having its wire wrapped round a parallelopiped; the magnetising effect remained the same. A needle and a long wire of platina were wrapped in a sheet of tin-foil, and that part which contained the needle introduced into a spiral of copper wire; the circuit was then made by the platina wire without the copper spiral; being in connexion with either pole, the needle became magnetised. A spiral of copper wire, with a needle in it, was placed on the surface of a basin of mercury, and the mercury then made part of the circuit: the needle became feebly magnetic. Sparks from a common machine, taken through a helix containing a steel needle, made the needle magnetic. These philosophers appear to have found that the connecting wire placed in other parts of the battery than from end to end would not magnetise needles. There was however, probably, some mistake in this.

392. M. la Borne, in repeating Arago's experiments, varied the use of the helix, by making it of iron, and putting it round the straight wire, through which an electrical discharge was made. The helix in this case became the needle to be magnetised, and it was found to be a strong magnet, the poles being in the positions so often referred to. Such a magnet is flexible and elastic, and may be doubled, lengthened, or shortened: on bringing the two poles together, its action on a magnetic needle was much diminished.

393. M. Berzelius described an experiment, which consisted in placing a thin leaf of tin, eight inches long and two inches wide, parallel to, and in the plane of, the meridian, and in that position connecting it with the elements of a Voltaic circle. A magnetic needle brought near the lower edge of this plate was thrown 20° from the magnetic meridian. On moving it slowly upwards, it took its natural position, when level with the middle of the plate, except that it was raised at one end, and depressed at the other; and, when near the upper edge, it moved 20° from the magnetic meridian in the opposite direction to what it did below. When the needle was moved up and down on the opposite side of the plate, the same deviation and effects took place, but in opposite directions. A small portion of the upper edge of the leaf was cut, and turned upwards, forming a projection above the edge. The needle, brought within equal distance of this projection and the edge, was more affected by the former than the latter.

394. Then, using a square plate of tin, and forming the connexion at opposite angles, it was found on examination that the intervening angles acted more powerfully on the needle than any other parts—'a circumstance which proves,' M. Berzelius says, 'that the magnetic polarity of the current goes to opposite extremities, as happens with electric polarity, and in artificial magnets.'

395. The tin band, or leaf, placed in a horizontal plane, and in the magnetic meridian, acted on the needle just as a wire would have done. The greatest deviation of the needle was immediately under or above the middle of the leaf, and the edges acted as in the former position. The positions assumed by the needles in these experiments was exactly what would be expected. The experiments received all their interest from the way in which their maker applied them to support his particular opinion, and apart from that had not much new in them. M. Berzelius thought that a round wire, when made the conductor, presented a more complicated case than when a square one, or a parallelopiped, was used.

396. In 1823 a paper was published by Sir Humphry Davy on the subject of electro-magnetism, which is of too important a character to admit of abridgment. He says, 'Immediately after Mr. Faraday had published his ingenious experiments on electro-magnetic rotation, I was induced to try the action of a magnet on mercury connected in the electrical circuit, hoping that, in this case, as there was no mechanical suspension of the conductor, the appearances would be exhibited in their most simple form; and I found that when two wires were placed in a basin of mercury perpendicular to the surface, and in the Voltaic circuit of a battery with large plates, and the pole of a powerful magnet held either above or below the wires, the mercury immediately began to revolve round the wire as an axis, according to the common circumstances of electro-magnetic rotation, and with a velocity exceedingly increased when the opposite poles of two magnets were used, one above, the other below.

397. 'Masses of mercury, of several inches in diameter, were set in motion, and made to revolve in this manner, whenever the pole of the magnet was held near the perpendicular of the wire; but, when the pole was held above the mercury between the two wires, the circular motion ceased, and currents took place in the mercury in opposite directions, one to the right, and the other to the left, of the magnet. These circumstances, and various others which it would be too tedious to detail, induced me to believe that the passage of the electricity through the mercury, produced motions independent of the action of the magnet; and that the appearances which I have described were owing to a composition of forces.'

398. Sir Humphry says, 'I endeavoured to ascertain the existence of these motions in the mercury, by covering its surface with weak acids; and diffusing over it finely divided matter, such as the seeds of lycopodium, white oxide of mercury, &c.; but without any distinct result. It then occurred to me, that from the position of the wires, currents, if they existed, must occur chiefly in the lower, and not the upper surface of the mercury: and I consequently inverted the form of the experiment. I had two copper wires, of about one-sixth of an inch in diameter, the extremities of which were flat and carefully polished, passed through two holes, three inches apart, in the bottom of a glass basin, and perpendicular to it; they were cemented into the basin, and made non-conductors by sealing-wax, except at their polished ends; the basin was then filled with mercury, which stood about a tenth or twelfth of an inch above the wires. The wires were now placed in a powerful Voltaic circuit. The moment the contacts were made, the phe-

nomenon, which is the principal object of this paper, occurred: the mercury was immediately seen in violent agitation; its surface became elevated into a small cone above each of the wires; waves flowed off in all directions from these cones; and the only point of rest was apparently where they met in the centre of the mercury between the two wires. On holding the pole of a powerful bar-magnet at a considerable distance (some inches) above one of the cones, its apex was diminished and its base extended: by lowering the pole further, these effects were still further increased, and the undulations were feebler. At a smaller distance the surface of the mercury became plane; and rotation slowly began round the wire. As the magnet approached, the rotation became more rapid, and, when it was about half an inch above the mercury, a great depression of it was observed above the wire, and a vortex, which reached almost to the surface of the wire.

399. 'In the first experiment which I made, the conical elevations or fountains of mercury were about the tenth or twelfth of an inch high, and the vortices apparently as low; but, in the experiments made at the London Institution, the mercury being much higher above the wire, the elevations and depressions were much more considerable, amounting to the fifth or sixth of an inch. Of course the rotation took place of either pole of a magnet, or either wire, or both together, according to the well-known circumstances which determine these effects.

400. 'To ascertain whether the communication of heat diminishing the specific gravity of the mercury, had any share in these phenomena, I placed a delicate thermometer above one of the wires in the mercury, but there was no immediate elevation of temperature; the heat of the mercury gradually increased, as did that of the wires; but this increase was similar in every part of the circuit. I proved the same thing more distinctly, by making the whole apparatus a thermometer terminating in a fine tube filled with mercury. At the first instant that the mercury became electro-magnetic, there was no increase of its volume.

401. 'This phenomenon cannot be attributed to common electrical repulsion; for, in the electro-magnetic circuit, similar electrified conductors do not repel, but attract, each other; and it is in the case in which conductors in opposite states are brought near each other on surfaces of mercury that repulsion takes place.

402. 'Nor can the effect be referred to that kind of action which occurs when electricity passes from good into bad conductors, as in the phenomena of points electrified in air, as the following facts seem to prove. Steel wires were substituted for copper wires, and the appearances were the same in kind, and only less in degree; without doubt, in consequence of a smaller quantity of electricity passing through the steel wire: and by comparing the conducting powers of equal cylinders of mercury and steel in glass tubes, by ascertaining the quantity of iron filings they attracted, it was found that the conducting powers of mercury were higher that those of steel; the first metal taking up fifty-eight grains of iron filings, and the second only thirty-seven.

403. 'Again, fused tin was substituted for mercury in a porcelain vessel, into which wires of copper and steel were alternately ground and fixed; the elevations were produced as in the mercury, and the phenomena of rotation by the magnet: and it was found by direct experiment, that the conducting powers of the tin, at and just before its point of fusion, did not perceptibly differ, and that they were much higher than those of mercury. Lastly, the communication was made from the battery by two tubes having nearly the same diameter as the wires, filled with mercury, so that the electricity, for some inches before it entered the basin, passed through mercury; and still the appearances continued the same.

404. 'From the rapidity of the undulations round the points of the cones, I thought they would put in motion any light bodies placed above the mercury; but I could not produce the slightest motion in a very light wheel hung on an axle; and when fine powders of any kind were strewed upon the surface, they merely underwent undulations, without any other change of place; and fine iron filings, strewed on the top of the cone, arranged themselves in right lines at right angles to the line joining the two wires, and remained stationary, even on the centre of the cone. The effect, therefore, is of a novel kind, and in one respect seems analogous to that of the tides. It would appear as if the passage of the electricity diminished the action of gravity on the mercury. And that there is no change of volume of the whole mass of the mercury, appears from the experiment; and this was shown likewise by enclosing the apparatus in a kind of manometer terminating in a fine tube containing air enclosed by oil; and which, by its expansion or contraction, would have shown the slightest change of volume in the mercury: none, however, took place when the contacts were alternately made and broken, unless the circuit was uninterrupted for a sufficient time to communicate sensible heat to the mercury.'

405. We may now direct the reader's attention to professor Barlow's admirable collection of experimental illustrations of this science. Mr. Barlow published a very interesting Treatise on Magnetic Attractions in 1823, but a new edition has since appeared. We shall only advert to the last section of the third part, referring our readers to the work itself for the fullest information on the subject.

406. We may commence with the most simple experiment, and show Mr. Barlow's mode of magnetising a steel bar. Take a piece of steel wire, as for example a sewing needle, and dip its ends first into steel or iron filings, in order to ascertain that it has no magnetism already in it, which will be the case if the particles of iron do not adhere to it; if they do, another needle must be tried, till one is found free from every species of magnetic action; this being done, connect the ends of the battery by the conducting wire, C Z and place the needle, N S, across it, fig. 10, plate II., drawing the latter backward and forward a few times, and it will be found to have acquired the magnetic property; for, on

immersing its extremities again in the filings, they will be found to adhere to it, in the same manner as to a needle magnetised in the usual way.

407. This very interesting experiment is strictly conformable to professor Barlow's hypothesis; for, according to this, the action of the galvanic particles in the wire, being tangential, will act upon the latent magnetic particles in the needle, in the direction of its length, and cause a displacement of them, precisely in the same manner as would be done by a magnet; and also, as in that case, the cohesive power of the steel preventing the return of the fluids to their natural state, the needle will remain magnetic.

408. This experiment was performed nearly at the same time by Sir H. Davy, and M. Ampere; but Sir H. Davy also succeeded in effecting the same with the common electrical machine, and showed that the magnetism might be excited at considerable distances, and consequently not only without rubbing the needle on the wire as we have described, but even without the contact. It requires, however, to effect this at the distances here alluded to, a very powerful apparatus.

409. If the needle be made a part of the galvanic circuit, or if it be placed lengthwise of the wire, no perceptible permanent magnetic power will be developed, which is also consistent with the hypothesis; because, in this case, the action of the wire will be transverse of the needle, which is the least favorable direction for the development of the magnetic power; the tendency of the action being to place the poles transversely, instead of lengthwise.

410. To ascertain the polarity of needles magnetised as in the last experiment, the wire and needle being placed as in the last figure, that is, the needle being above the wire, and Z denoting the zinc end of a battery of two plates only, it will be found that the extremity N will attract the south end of a compass needle, and the extremity S the north end; in short, that the north poles of the latent magnetic particles have been carried towards the left hand, and the south towards the right hand.

411. Let the needle now be placed under the wire, instead of being placed over it, and in other respects the process described in the last example repeated, and it will be found that the polarity of the needle will be exactly the reverse of that in the last experiment, which ought to be the case according to the principle of the preceding experiment; because by this the north polarity is always carried to the left hand of the observer, who conceives himself to form the galvanic circuit, his head being towards the zinc end, and his face towards the magnet; for thus, his position being now the reverse of what it was in the preceding experiment, the polarity ought to be the reverse also.

412. If we wish to magnetise a needle by placing it in a spiral conducting wire, let ZC (fig. 11) represent a conducting wire bent into a spiral form, and let the needle *ns* be placed either naked in the spiral, or enclosed in a glass tube, or in a tube of any other matter; make the connexion with the battery, and in an instant it will be found that the needle *ns* has become strongly magnetic, having its poles posited, as shown in the figure, viz. having its north end towards the zinc extremity of the battery.

413. This is of course precisely similar to the first experiment, the only difference being that, by means of the spiral form given to the wire, the action upon the needle is repeated as many times as there are spires of the wire covered by it; the power excited is therefore proportionably stronger, and the magnetism more quickly communicated. The explanation of the effect produced is exactly the same as in the last experiment. If the direction of the contact be changed, by supposing Z to communicate with the copper side of the battery, the effect will be in all respects the same, except that the polarity of the needle will be reversed. The end towards Z, in this case, becoming the south instead of the north pole. Or if a spiral, having its spires turned the contrary way, as shown in fig. 12, be used, and Z be supposed to communicate with the zinc side of the battery, the polarity will also be the reverse of that in the first case; viz. the poles will have the direction marked in the figure; and if here again the contact be changed by connecting Z with the copper side, the poles will be once more inverted, and have the same direction as at first. These facts, as we have stated above, are explained exactly in the same manner as those for the single wire.

414. In performing this experiment, Mr. Barlow employed a glass tube about five inches in length and half an inch in diameter; and it was observed, when the needle was placed in it, so that one half of it projected beyond the end that the moment the plates reached the acid, the needle was drawn instantly to the middle of the tube, and while the contact was continued it was held suspended in the centre of the tube when the latter was held vertically, the suspending power of the spiral exceeding the power of gravity.

415. This effect is very curious, because the needle here remains suspended in the open space, directly in the axis of the tube, and not attached to either sides as in the usual cases of suspension by attraction.

416. To examine the effects of a spiral conducting wire on a floating magnetised needle, let a wire be wound about a glass tube of about half or three-quarters of an inch diameter, and hang it within a basin of water, as shown in fig. 13, so that the surface of the water rises to about the axis of the bore; then having pierced a small piece of cork with a needle previously magnetised, so as just to preserve it from sinking when immersed in the basin, make the connexion with the battery. The needle will instantly be agitated, and will soon arrange itself in front of the spiral in a direction parallel to its axis, and then suddenly dart into the interior of the tube with a force nearly sufficient to carry it to the other extremity; it then returns again towards the other end, and at length becomes stationary in the middle of the axis, arranging itself exactly parallel to it.

417. If the spirals have the direction shown in the figure, and Z communicates with the zinc side, the needle, if placed near the extremity of the tube A, will enter with its south

end; if placed near the other extremity it will enter with its north end; but, if the direction of the spiral be changed, the needle will enter in both cases the reverse way, as it will also if the direction of the spires remain the same, but the contact be changed. This experiment will succeed equally well if the tube be placed upright in the water; the needle will then dive like a fish, and remain below till the contact is broken.

418. This entertaining and instructive experiment is due to Mr. Faraday; the explanation of it by the previous hypothesis is obvious, for the north pole of the particles of the needle being carried to the left of an observer conceiving himself coinciding with the direction of the wire, and with his head towards Z, all the effects ought to take place precisely as above stated. M. Ampere had assimilated a spiral wire of this kind with an actual magnet, and Mr. Faraday instituted the above experiment to prove that there was not that identity which had been assumed; for, by suspending a hollow cylindrical magnet in the same way, the needle was always attracted to the nearest extremity of its edge, and indicated no tendency to enter the tube.

419. To show the effect produced by a galvanic wire on steel or iron filings, we must strew a quantity of iron dust or filings on a table, and bring the connecting wire near to them, when the filings will immediately be affected by the action of the wire, some few flying towards it, and adhering to it as a magnet; and, if the wire be brought into actual contact with them, a very considerable quantity may be taken up by it, exactly the same as at the extremity of a bar magnet; but the moment the contact is broken the filings fall.

420. In order to produce the best effect in this experiment, the wire intended to be operated upon should be smaller than the conducting part of the circuit. This latter, in all cases, is the better for being stout, at least three-sixteenths of an inch in diameter; but in this, as in several other experiments, it is best to have the extremities of the wires terminated by a much smaller wire, wound round the former as a spiral, or by simple contact; for by this means, the transmission being made through a smaller space, the intensity of action is proportionably increased.

421. This experiment is due to M. Arago, and it seems at first sight somewhat at variance with Mr. Barlow's hypothesis; because we have here an appearance of actual attraction between the iron and the wire, whereas we have supposed that there is no attraction between them. A little consideration will, however, show, that instead of contradicting, this fact will serve to confirm the hypothesis in question.

422. Let us, for example, conceive W, fig. 14, to denote the section of our conducting wire descending vertically from the zinc end of the battery; then, the first and direct action of this wire will be to excite magnetism in any small particle of iron, *n s*, according to the direction indicated by the letters in the figure.

423. After which, the action of the wire will be to urge the point *n* in the line *n n*, perpendicular to *n* W, and the point *s*, in the line *s s*, perpendicular to *s* W; and, in consequence of the combined action of these forces, the particle *n s* ought necessarily to approach the wire in the same way as it would do by a direct attractive force. This effect is therefore still consistent with our hypothesis, and strongly confirmatory of it.

424. We have seen that, by giving the conducting wire a spiral form, its power of magnetism is much increased; and in the same way the power of the wire on the iron filings may be rendered very great. The best form for the spiral, however, here, is that in which the wire lies all in one plane, as was shown in a previous figure.

425. This, being connected by its two extremities with the poles of the battery, will take up an astonishing quantity of filings, which, by their reciprocal attraction towards each other, exhibit the most pleasing appearance.

425*. To exhibit the rotation of a magnet round a galvanic wire, let A B E D, fig. 15, represent a cup of glass, wood, or any other non-conductor, and N S a small magnet, having a hole drilled at S, whereby it may be fixed by a short piece of silk S*c*′, to the copper wire *c*′ C, passing through the foot of the cup, and let mercury be poured into the latter till the needle floats nearly vertical. Conceive, also, Z *z*′ to be part of the conducting wire, descending from the zinc side of the battery, and slightly immersed in the quicksilver. If now the contact be made at C with the copper side of the battery, the magnet N S begins to rotate about the wire Z *z*′, passing towards the left hand of the observer. This rotation will be greater or less according to the power of the battery, and will continue while there is sufficient force in the latter to overcome the resistance of the quicksilver to the motion of the magnet. If the descending wire proceed from the copper side of the battery, the motion will take place in a contrary direction, that is, from left to right.

426. Or, if the contact remain the same, and the magnet inverted, then also the motion will be reversed; but if the contact and magnet be both reversed, the rotation will be the same as in the first instance. This highly curious and important experiment, which is due to Mr. Faraday of the Royal Institution, is immediately explained by the same hypothesis; according to which, the extremity N of the magnet is always acted upon by two forces, one being the galvanic force, which is tangential to the wire, and the other the tension of the silk S*c*′, in the direction of the needle. Let this latter be resolved into two forces, one vertical and the other horizontal, and we shall find the extremity N under the influence of two horizontal forces, one always central and the other tangential. The result of which must be a rotation of that point about the wire; and it will be made with the position and arrangement shown in the figure from right to left.

427. To exhibit the rotation of a galvanic wire about the magnet, let A B D E, fig. 16, be a cup or vessel of wood or glass, and N S a magnet passing tight through its foot; Z *z* a conducting wire descending from the zinc side of the battery, and rendered free to move by the chain connexion at *g*. Let mercury be poured into the vessel till the extremity of the wire is slightly

immersed in it. Then the contact being made at C (which, by means of the wire DC, communicates with the quicksilver) the wire $gz$ will immediately assume a rapid rotatory motion, much greater than in the former case, the resistance being very considerably diminished by the mode of suspension. The direction of the motion, according to the arrangement in the figure, being from left to right, to a person coinciding in position with the magnet. It may, however, be reversed by reversing the magnet, or by changing the contact, as in the preceding cases.

428. This experiment is also due to Mr. Faraday, and its explanation is the same as the last; for since when the magnet is free, it will, as we have seen, revolve about the wire from right to left, it follows that, when the magnet is fixed and the wire free, the latter will revolve in an opposite direction (the action and re-action between the wire and the magnet being reciprocal), which is still, however, towards the left of a person supposed now as coinciding in position with the magnet, and his head to the north.

429. The resistance being very inconsiderable in this experiment, it may be exhibited in a more simple manner. For instance, instead of piercing the foot of the cup, as in the figure referred to, it will be sufficient to use a tea-saucer, or any other shallow vessel, and to bring a strong magnet as near to it as possible under the table; when the motion will take place precisely in the same manner as above.

430. By this means also we may establish a most important fact, viz. that it is indifferent, as to the result of the experiment, what may be the position of the magnet; that is to say, if we keep the extremity of it as nearly as possible under the centre of the vessel, we may hold it either vertical or horizontal, or incline it in any angle, and at any azimuth, without greatly changing the rate of the rotation; it being always understood that the magnet should be of considerable length, in order that its other pole may not affect the motion of the wire.

431. The machine for the exhibition of these motions, according to Mr. Faraday's construction, is shown at fig. 1, plate III. ABCD is a stand of wood, EF a brass pillar, FG a fore arm or projecting piece of brass, through the extremity of which passes the wire LHK; at L there is a sort of ball and socket joint; the socket being in the upper part, and the ball fitting it, on the small wire $Lm$. Both the socket and ball are amalgamated, and a piece of silk fixed to the ball, or head of the wire, passes through a hole drilled in the wire LH, and by which the smaller wire is suspended, thereby preserving the contact, and leaving to the latter a perfect freedom of motion: $ab$ is a glass cup having a hole through its foot, into which is inserted a copper tube, soldered to a copper disc just the size of the bottom of the glass, and which disc is cemented to the foot of the latter.

432. The wire $Zz$ is also soldered to another copper disc, upon which the glass rests; and by which the contact is carried on from Z to the quicksilver in the cup, and thence to the wire $m$L; lastly, a small magnet $ns$ is inserted into the copper tube, passing through the stem of the glass above mentioned.

433. The foot of the cup $cd$ is pierced, and discs of copper applied as in the cup $ab$; but the wire passing through the foot is solid, and to it is fixed, by a short string, the small magnet $ns$, which is thus free to revolve about the descending wire HK; quicksilver, as in the preceding cases, being poured into the cup, till the wire HK is slightly immersed in it at K. The contact with the battery being now made at Z and C′, the motions will take place as described in the last two experiments; viz. that the magnet $ns$ in the one cup will revolve about the wire K, while the wire $Lm$ will at the same time be revolving about the other magnet $ns$.

434. If the cup $cd$ be placed where the cup $ab$ is represented, then the magnet and wire being both free, they will revolve about each other, and thus produce a pleasing variety in the experiment.

435. A section of this machine is shown at fig. 2.

436. Mr. Faraday also describes another apparatus, which requires a less galvanic action than the former to produce the rotation. This is shown at fig. 3; it consists of a piece of glass tube, the bottom part of which is closed by a cork, and through it is passed a small piece of soft iron wire, so as to project above and below the cork. A little mercury is then poured in, to form a channel between the iron wire and the glass tube. The upper orifice is also closed by a cork, through which a piece of platinum wire passes, being terminated within by a loop; another piece of wire hangs from this by a loop, and its lower end, which dips a very little way into the mercury, being amalgamated, it is preserved from adhering either to the iron wire or the glass. Things being thus arranged, a very minute galvanic power being applied by contact with the lower and upper end of the apparatus, and the pole of a strong magnet being applied to the external end of the lower iron wire, the moveable wire within begins rapidly to rotate round the temporary magnet thus formed; and which rotation may be inverted either by changing the contact or by inverting the magnet. Mr. Faraday states that this instrument is so sensible that a rotation has been produced in it by two plates, each only one inch square.

437. To exhibit the rotation of a magnet on its axis by the effect of a galvanic wire, let ABDE, fig. 4, represent a cup of glass or wood, NS a magnet, having at its lower extremity a fine steel point, inserted in the agate $a$; $bc$ is a thin slip of brass or ivory, having a hole through which the magnet passes freely, and by means of which it is kept perpendicular: at the upper extremity N of the magnet is a thin cylinder, as a piece of quill, forming a cup or reservoir $z$ to receive a small quantity of quicksilver; and into this is inserted the wire Z, amalgamated at its lower point; and $Cc$ is a stout wire passing through the side of the cup into the quicksilver. Then, the contact being made at C and Z, the magnet will begin to revolve on its axis, with a very astonishing velocity, and continue in motion while the power of the battery lasts.

438. This pleasing experiment is due to M.

Ampere, who employs only a piece of platinum attached to the magnet, to produce, by its superior gravity, a vertical position of the latter in the mercury; the upper wire being then inserted into the quicksilver in the cylinder *z*, and the other wire into the cup C, the motion is produced exactly as above described: the greatest freedom of motion is, however, given by the apparatus shown in the figure. The explanation of this rotation is very obvious according to the hypothesis we have adopted, for the tangential force of the wire, acting upon the magnetic particles on the surface of the magnet, must necessarily produce the rotation in question.

439. To exhibit the rotation of a galvanic wire on its axis by the action of a magnet, let N S, fig. 5, be a magnet, represented as broken in the figure, but which is fixed, in the experiment, in a foot, in order to keep it vertical, and let *a b c d* be a light hollow copper or brass cylinder, having a steel point passing downwards into the agate cup *f*, fixed to the upper end of the magnet, and let *e* be a small tube or quill fixed on the wire passing through the top of the cylinder, holding a little quicksilver, and receiving into it the descending conducting wire Z. A B is a piece of wood turned to fit on the cylindrical magnet N S, which has a hollow groove on its upper surface to receive a quantity of quicksilver, into which the lower edge of the cylinder *a d* is slightly immersed, the surface being covered with weak dilute nitric acid. A C is a wire passing into the quicksilver. It is obvious that thus (the contact being made at Z and C) the galvanic circuit is carried from Z through the cylinder *a b c d*, thence to the quicksilver, and hence again through the wire A E, to the other extremity of the battery, whereby the cylinder *a b c d* is made to become a part of the conducting wire; and it will be found to revolve on its axis with a great velocity, fully equal to that of the magnet in the last experiment; the direction of the motion, with the arrangement shown in the figure, being from left to right, to a person coinciding in position with the magnet.

440. To exhibit a quicksilver vortex by means of a galvanic wire and magnet, it is only necessary to take any shallow non-conducting vessel, and put into it a quantity of pure mercury, into which is to be inserted the conducting wires Z, C, proceeding respectively from the zinc and copper sides of the battery. And if now the north end of a strong magnet be brought under the vessel, the quicksilver round the wire C will begin to revolve about the same, forming a beautiful vortex; the direction of the motion being from left to right. If the magnet be removed under the other wire, the same kind of motion will be produced, but its direction will be reversed; and the same change of motion will take place, of course, in each case, by changing the end of the magnet.

441. The explanation here is precisely the same as in the last experiment; the moveable part of the conductor in this case owing its mobility to its fluid nature, whereas in the former it is due to the peculiar mode of suspension. This very elegant experiment was, as we have stated in another place, first made by Sir H. Davy.

442. To exhibit the rotation of the galvanic wire, independently of the galvanic battery, we must employ the apparatus exhibited in fig. 6, where A B C D is a small copper vessel about two inches and a half high, and the same in diameter; *a b c d* is another small cylinder of copper, of the same height, soldered to the former vessel at its lower end *d e*, a hole being left in the bottom of the former to receive it. The cylinder *a b c d* is therefore open, and will admit a cylindrical magnet to be passed up; and it will, at the same time, hold a quantity of dilute acid within the space A D, *d a b c*, B C: *z z'* is a zinc cylinder, very light, of rather less altitude than the copper one. To the cylinders *a b* and *z z'* are soldered two copper wires, as shown in the figure, the upper one having a steel point proceeding from E downwards, and resting in a small metal hole at F; and consequently the cylinder *z z'* will be free to move upon its point of suspension at F.

443. The apparatus being thus arranged, and the acid placed in the cell as above described, insert through the interior cylinder the north end of a strong cylindrical magnet, and balance the whole apparatus upon it, when immediately the zinc cylinder will begin to revolve with a greater or less velocity, according to the strength of the acid, the freedom of motion, and the power of the magnet. Mr. Barlow has frequently produced, with this simple apparatus, a motion, amounting to 120 rotations per minute. The only difference between this and the other rotations we have described is, that the galvanic power is here produced by the apparatus itself, instead of having recourse to the battery.

444. For it is obvious that the wire from Z Z' to E, may be considered as a conductor proceeding from the zinc; and the wire from *a b* to F, as one from the copper side of the battery; and consequently, the same effect is to be expected here as in the preceding cases. It is unnecessary to add, that, with the north end of the magnet upwards, the motion is from left to right, and the contrary with the magnet reversed. This experiment is due to M. Ampere.

445. A very pleasing addition has been made to this apparatus by Mr. J. Marsh. It consists in having a second point descending from F, which is made to rest in an agate cup, fixed on the top of the magnet, fig. 7, and upon which the whole machine is balanced, having a perfect freedom of motion; and, to preserve this balance, the magnet is placed vertically in a foot. The machine being now charged with acid, a compound motion takes place, the zinc cylinder revolving in one direction, and the copper vessel in another, producing thus a very pleasing effect; the latter, however, is by no means so rapid as the other, in consequence of the weight of the acid; and, in fact, that of the whole machine being supported on the lower point.

446. To show the effect of a horse-shoe magnet on a freely suspended galvanic wire, let Z *z*, fig. 8, denote a part of the galvanic wire, freely suspended by the chain connexion at *o*, proceeding from the zinc end of a battery, its lower extremity being amalgamated, and slightly immersed in a reservoir of pure mercury, having a

connexion at C with the other extremity of the battery. N S is a horse-shoe magnet, posited as shown in the figure.

447. The contact being now made at C and Z, the hanging part of the wire, $oz$, will be thrown out of the mercury into the position $o z'$; the contact being thus broken, it falls by its own gravity into the mercury; by which means, the contact being renewed, it is again projected, and so on with an extraordinary rapidity; and if the position of the magnet be reversed, or the contact be changed, the direction of the motion will be changed also, but the effect will be the same.

448. This singular motion may be still explained by the hypothesis that has been advanced; for the wire having a tendency to pass round the north end of the magnet to the right hand, and round the south end to the left hand, is urged by equal forces directly in a line with the open space of the magnet, the equality of the two forces preventing the rotatory motion about either, but both conspiring to give to the wire the rectilinear motion which has been described. This experiment is also due to Mr. J. Marsh.

449. If we wish to exhibit a wheel and axle rotation by means of a horse-shoe magnet, the machine represented in fig. 9 will produce this motion. A B is a rectangular piece of hard wood; C D an upright wooden pillar; D E a piece of stout brass or copper wire; and $ab$ a somewhat smaller wire, soldered upon it at E, on the lower side of which the wheel W, of thin copper, turns freely; $hf$ is a small reservoir for mercury, sunk in the wood; and $g\ i$ a narrow channel running into it. H H is a strong horse-shoe magnet. Mercury being now poured into the reservoir $fg$, till the tips of the wheel are slightly immersed in it, and the surface covered with weak dilute nitric acid, let the connexion with the battery be made at $i$ and D, and the wheel W will immediately begin to rotate with great velocity. If the contact be changed, or if the magnet be inverted, the motion of the wheel will be reversed; but, in general, the best effect is produced when the wheel revolves inwards. The suspension of the wheel is shown in fig. 10. This is a necessary consequence of the motion described in the last experiment, by which it was suggested, and is explained on the same principles.

450. The machine for exhibiting a compound wheel and axle rotation, with two horse-shoe magnets, is shown in fig. 11. A B C D is a rectangular piece of board, having two grooves about half an inch deep, cut in it parallel to its length. C $p$, Z $q$, are two wires, having cups for connexion at Z and C, and each passing into its respective groove, $ab$, $cd$, filled with mercury, into which are slightly immersed the points of the wheels W W'; these being fixed on an axle W W', and resting upon the two supports $mn$, $rs$, brought to a fine edge at $n$ and $s$, in order to reduce the friction as much as possible, and to give the greater freedom of motion. N S are two horse-shoe magnets, posited as in the figure, with the like poles interior and exterior of the wheels.

451. The apparatus being thus prepared, and the contact made at Z and C, the wheels will begin to rotate, and in a very short time will acquire a velocity exceeding, very considerably, any of the motions hitherto described.

452. It is unnecessary to say, that by changing the contact, or by inverting the magnets, the direction of the rotation will be also changed. The usual precaution of covering the surface of the mercury with weak dilute nitric acid, will increase the rapidity of rotation; but it is not actually necessary in this case.

453. To exhibit the terrestrial directive quality of a galvanic wire, let A B, fig. 12, represent a piece of wood fixed to any convenient support, through which pass the two wires G, E, and where they remain fixed. At their upper and lower extremities are soldered the small metal cups, $a$, $b$, $c$, $d$. D H I K, &c., is a part of the conducting wire, bent into the form shown in the figure, having small steel points soldered upon it at $c$ and $d$. These points are inserted into the cups $c$, $d$, the upper one only resting on the base of its cup, the other being merely brought into contact with $d$, by a little quicksilver placed in it for that purpose, by which means the rectangle has a great freedom of motion given to it, the only solid contact being on the point $c$. Mercury is also poured into the other cups, for the sake of a more perfect and certain communication than that afforded by the mere juxta-position of the wires.

454. The apparatus being thus prepared, the two wires proceeding from the copper and zinc sides of the battery, are inserted into the cups $a$, $b$, and thus the connexion is established; first by means of the wire G with the cup $c$, thence by means of the contact of the points with the cup and mercury; it is carried forward from $c$ through the rectangle, to the cup $d$, whence it proceeds to the cup $a$.

455. We have already seen that of this connecting wire, the part from $c$ to $d$ has a perfect freedom of motion upon the point at $c$, and will therefore obey any exciting force. This force, in the experiment in question, is the magnetic influence of the earth; and in consequence of which the rectangle, immediately the contact is made, places its plane perpendicular to the plane of the magnetic meridian; and to which position it will always return, after a few vibrations, if it be drawn out of it by the hand or otherwise.

456. This arrangement of the moveable conductors is perfectly consistent with our hypothesis, as is obvious without any farther illustration than what has been given in several preceding experiments.

457. A differently formed wire, and a more simple mode of suspension, is shown in fig. 13. Here a brass or copper wire, A C, rests at its bent end A, in a cup containing a little mercury, and is very moveable in azimuth round this point. The other end passes through the centre of a circular piece of pasteboard, and then forms spiral turnings in the plane of this circular piece. The wire is attached by thread or silk to the pasteboard disc; and at the point B it turns and descends till its extremity reaches the quicksilver in the cup D. The communication being now made at A and D with the battery, the spiral will immediately arrange itself, as in the last

case, in a plane perpendicular to the magnetic meridian. This experiment is originally due to M. Ampere, but the mode of suspension described is that of professor Van den Boss.

458. A needle, upon a different construction, also due to M. Ampere, is shown in fig. 14.

459. The directive quality of the galvanic wire has been since exhibited in a variety of ways, much more simple than that above described, of which we shall only state the following:—

460. M. de la Rive's apparatus consists of a small galvanic combination attached to a cork; the plate of zinc is nearly half an inch wide, and extends about one and a half, or two inches, below its cork, its upper end passing through the same; the slip of copper is of equal width to the zinc, but passes round it, being thus opposed to both its surfaces, as in Dr. Wollaston's construction: its upper end also appears through the cork. A piece of copper wire, covered with silk thread, is coiled five or six times, and tied together, so as to form a ring about an inch in diameter; and the ends of the wire are connected by solder, one with the zinc, and the other with the copper slip above the cork. See fig. 15.

461. When this small apparatus is placed in water, slightly acidulated with sulphuric or nitric acid, the ring becomes highly magnetic, and will arrange itself in a plane perpendicular to the magnetic meridian, or it will at least indicate a tendency to take up that position; but the escape of the bubbles, arising from the decomposition of the water, prevents it from preserving a fixed direction.

462. Its magnetic qualities, however, are more obviously shown by bringing to it a strong magnet. Mr. Barlow used a cylindrical one, about three quarters in diameter, and eighteen inches in length. This being applied at the distance of several inches, the ring was immediately attracted or repelled accordingly, as one or the other of the poles of the magnet was presented, or accordingly as one or the other side of the wire was opposed to the latter. When the result of the application is attraction, the cork will advance towards the extremity of the magnet; and if the latter be held horizontally, and in a line with the centre of the former, this will continue to advance till the pole of the magnet is within the ring, and then proceed with considerable velocity till it reaches the middle of the magnet, where it remains perfectly stationary. If now the magnet be withdrawn, and changed end for end, and re-introduced into the ring, the latter will go off from the magnet, turn itself round when quite free from it; again advance, and settle itself as before in the centre.

463. This very simple apparatus, which may be made at the expense of about a shilling, throws great light upon the nature of the electro-magnetic action, and proves most satisfactorily, that notwithstanding the intimate relation between the electro-magnetic, and simple magnetic fluids, they are not identical; for no possible arrangement of simple magnets can be made that would lead one of them beyond the pole of another, to find its state of equilibrium in the middle of the latter. At the same time all the above facts will be found perfectly consistent with the hypothesis that has been advanced; for it will be seen, when the wire and cork are in equilibrium, as above stated, that an observer will have the north end of the magnet to his left hand, and the south to his right, at equal distances; and acting therefore with equal and opposite powers; consequently the wire itself ought to be in equilibrio, and, when disturbed from, it will have a tendency to regain it, and hence be subject to all the conditions and motions that have been described.

464. As the current of electricity, produced by a Voltaic battery when passing through a metallic conductor, powerfully affects a magnet, tending to make its poles pass round the wire, and in this way moving considerable masses of matter, it was supposed that a re-action would be exerted upon the electric current capable of producing some visible effect; and the expectation being, for various reasons, that the approximation of a pole of a powerful magnet would diminish the current of electricity, the following experiment was made:—The poles of a battery of from two to thirty four-inch plates were connected by a metallic wire, formed in one part into a helix, with numerous convolutions, whilst into the circuit, at another part, was introduced a delicate galvanometer. The magnet was then put, in various positions, and to different extents, into the helix, and the needle of the galvanometer noticed; no effect, however, upon it could be observed. The circuit was made very long, short, of wires of different metals and different diameters down to extreme fineness, but the results were always the same. Magnets more and less powerful were used, some so strong as to bend the wire in its endeavours to pass round it. Hence it appears, that however powerful the action of an electric current may be upon a magnet, the latter has no tendency, by re-action, to diminish or increase the intensity of the former.

465. M Prechtl has a very curious experimental illustration of the effects of a spiral wire. He coils round a glass tube or wooden cylinder, steel-wire covering the surface as with a continuous sheath. To one end of this cylindric spiral, he applies the south or north pole of a magnet, and draws it along the cylinder in a straight line, parallel to the axis. In this way a magnet is formed, which possesses the following properties:—

(*a*) Along its whole length, it has on one side the north, and on the opposite side, the south pole.

(*b*) These transversal magnetisms are in every point of the length of the wire-cylinder, equally strong.

(*c*) Both of its ends exhibit on the contrary no particular polarity, and they have no other magnetism than that which belongs to every individual point of the whole length. Thus the transversal magnet is in the same condition as the conjunctive wire of the Voltaic column.

(*d*) If we hold this transversal magnet over a magnetic needle in the declination-plane, it repels exactly like the conjunctive wire, the north pole of the needle to the right or to the left, ac-

cording as the effective north pole of its transversal magnetism lies to the left or to the right hand; and with greater or less force, according to the strength of its magnetism, even to 90°.

(*e*) If we draw the one pole of a magnet along this transversal-magnet, in a spiral direction, the wire becomes magnetised longitudinally; the transversal magnetism disappears, the two poles are found at the two extremities, and it now resembles an ordinary magnetised steel wire. The longitudinal and transversal magnetisms are not compatible with each other, in their full exhibition.

466. Besides this transversal magnetism, with single polarity, magnets may be easily made, possessing several transversal magnetisms. Take four magnetic bars, about a quarter of an inch thick; provide a small disc of wood, with an aperture of about an inch diameter in its centre, and four grooves, cut into one face of the disc, leading from the circumference, inwards: in these grooves the magnetic bars are to be fixed, with their narrow edge outwards, and their ends projecting into the aperture. Let a north pole alternate with a south pole in the circle, so that the ends of the bars right opposite to each other may be homogeneous; and adjust the whole, so that they may touch the circumference of a steel wire-coil, about half an inch diameter. We then draw this spiral wire through the opening, and between the four magnets, taking care that the cylindric coil does not revolve on its axis, but that the direction of each individual magnetic pole remains in the same plane with the axis; for otherwise the wire would acquire the longitudinal magnetism. Instead of the wire-coil, we may take a massive cylinder of steel. This will acquire, when treated in the same way, the compound transversal magnetism, without its extremities having a stronger magnetism than each of its cross sections. These transversal magnets with manifold polarities, have all the above enumerated properties of the single transversal magnets, but their phenomena are still more in unison with those of the electrical conjunctive wire; for, under this manifold polarised magnet, the deviation of the needle is the reverse of that above the magnet.

467. In the following manner we may produce a section of a manifold polarised transversal magnet in a larger rod, and with a proportionally greater number of poles. We take a ring of steel wire, from four to six inches diameter, and furnish it with as many poles as we can apply to its circumference. Lay the ring flat on a table, and apply to its outer edge the two poles of a horse-shoe magnet, that are as near each other as possible; then remove the magnet and apply it in succession all around, at distances equal to the width of its own poles. In this way it is easy to induce on a steel ring, of about five or six inches diameter, from twenty to thirty opposite poles.

468. This steel ring, which represents a section of the manifold polarised transversal magnet, exhibits, relatively to the greater extension and smaller number of the existing magnetisms, the phenomena which a conjunctive wire presents. In every part of it the magnetic needle, with its north end above, stands to the right hand; below it, to the left; and inversely. M. Prechtl thinks that these direct results leave no further doubt concerning the magnetical condition of the conjunctive wire.

469. Although success had attended the experiments made to magnetise steel needles and bars by ordinary electricity when in motion, yet every attempt to occasion the deviation of the magnetic needle by a current from the machine had failed, until M. Colladon instituted his experiments. Conceiving that the quantities of electricity operated with had been too small, he used a battery of thirty jars, containing 4000 square inches of surface for the previous accumulation of the electricity, and operated with a galvanometer constructed on Nobili's principle, having 100 revolutions of wire. The wire was covered with a double thickness of silk, and the instrument placed in a room away from that containing the battery. Two copper wires covered with silk, and suspended on silk cord, connected it with the electrical apparatus. A very fine point was soldered on to each of these wires, which were then named the extremities of the galvanometer.

470. The battery was charged: one galvanometer extremity was connected with the outer coating, and the other approached towards a ball in connexion with the inner coating. When at four or five centimetres' distance, (an inch and a half or two inches) the needle deviated; when at less than half that distance, the deviation was 23°, and, gradually diminishing, continued for five seconds. The direction of the deviation accorded with the course of the electricity. Every repetition of the experiment gave the same result, and when the points brought to the battery were changed, or the charge of the battery itself was altered, the direction of the deviation corresponded with it. The quantity of deviation varying with the distance of the points was often 40°; and the return of the magnetic needle to its original position, upon the cessation of the current, was in every instance ascertained.

471. On making experiments with a Nairn's machine, and also with a plate machine, no accumulative apparatus being used, deviations of the needle, amounting to 3° or 4°, were obtained in dry weather.

472. It was thus demonstrated that the electrical machine could, like the Voltaic pile, produce a current competent to the deviation of the needle, and that the electricity accumulated in a given time in a battery, or even in a conductor, was a finite portion of that which circulated in the same time in a closed electro-motive circuit. To establish this comparison in a more definite manner, a wire of platina was soldered to the two extremities of the galvanometer, one of the junctions heated, and the other cooled; at 125°, C. (268° F.) the needle of the galvanometer deviated 45°, the same quantity which had been produced by the battery. Hence it appears that the galvanometer may, in certain cases, be a very useful indication of the quantities of ordinary electricity.

473. The insulation of the different turns of the galvanometer wire, appearing to be an im-

portant point, M. Colladon prepared an instrument, in which the wire was covered with two folds of silk, made 500 turns round the box, and had each separated from the others by oiled silk. With this instrument the effects were nearly tenfold what they were before, and as, in the former case, the deviation of the needle, by the current from a machine, was only 3° or 4°, now it amounted to much larger quantities. When the point was at the distance of—

| | | | | |
|---|---|---|---|---|
| 1 decimetre (3·937 inches) | | the deviation was | | 18° |
| 2 | ditto | ditto | ditto | 10 |
| 4 | ditto | ditto | ditto | 5½ |
| 8 | ditto | ditto | ditto | 3 |
| 1 metre (39·371 inches) | | | ditto | 2; |

so that it was rendered sensible at the distance of a metre from the conductor.

474. It should be remarked that the withdrawing action of a point is sensibly proportional to its distance from the conductor. This is constantly the case with a cylinder machine, but seemed to be interfered with in a plate machine by the presence of four cushions. Experiments, instituted to illustrate this point, proved the correctness of this conclusion. When the motion of the cylinder machine was regular, the deviation remained constant as long as the experiment was continued.

Operating with the battery, and slowly approaching the point, a constant deviation of 30° was obtained for sixty-five seconds. A jar, containing only two half-square feet of surface, deviated the needle 32°.

475. The ratios which these experiments establish between the action of currents produced by electrical machines, and those of a pile or a thermo-electric arrangement, afford the means of appreciating the absolute velocity with which the electricity moves in a closed electro-motive apparatus, when we know their electro-motive force, or the tension which may be produced by the contact of two metals, and the friction of cushions. In fact, in electrical machines, this velocity of circulation is determined by the motion of the glass plate, by which the electricity is transported to the conductors with a known velocity. If the tension of this electricity is ten thousand times stronger than the tension of a pair of Voltaic plates, having the same surface as the cushion, and nevertheless the effects produced by the two currents on a galvanometer are the same, the velocity of circulation of the electricity from the Voltaic arrangement would be evidently ten thousand times greater than that of the rubbed part of the plate; for it is an acknowledged opinion, that the deviation of the magnetic needle is proportional to the quantity of electricity which passes in the current.

476. Comparative experiments, made with piles and thermo-electric circuits, prove that the conductibility of metallic wires is not in the inverse ratio of their length. When the electromotive force is small, a metallic circuit of moderate length is sufficient to stop the electric current almost entirely. The intensity of the current rapidly increases as the length of the circuit is diminished to a certain limit, dependent on the energy of the electro-motive force.

477. M. Colladon observes also, that although bad conductors, as pure water for example, cannot be made part of a Voltaic circuit without stopping the motions of the galvanometer; yet a layer of air, of more than a metre in thickness, does not always prevent this kind of action, and that the results depend upon the energy of the electro-motive force; so that this becomes an important element, not to be neglected in experiments on the conductibility of bodies.

478. Taking advantage of some stormy weather, M. Colladon was enabled to obtain deviations of the magnetic needle by currents of atmospheric electricity, and has shown that the instrument may become a very precise and useful indication of the state of this agent in the atmosphere. A metallic point being raised on the observatory of the college of France, and connected with the galvanometer, whilst the other extremity of the instrument wire was communicated with the stem of a lightning-rod, deviations were obtained of 32°, 34°, and 37°. The direction of the needle indicated negative electricity, and by dismounting the apparatus, and using an electrometer, this was found to be the case. On another occasion the deviation was from 10° to 22°, and, during the twenty minutes that the instrument was observed, the direction of the current changed two or three times. On another occasion the deviation amounted to 87°. These results were obtained with the first and least sensible galvanometer.

479. These experiments prove that the galvanometer may be very useful in researches on atmospheric electricity. If it should be demonstrated that electricity contributes to the formation of hail, this instrument would be the only one which could indicate in a precise manner the quantities of electricity withdrawn by points more or less acute and elevated, and communicating more or less with the soil.

480. M. Nobili's galvanometer is a curious instrument. Its construction is founded upon the fact discovered by Oersted, the deviation of a magnetic needle by a wire conveying a current of electricity; and, as in most other instruments of this kind, the wire is passed several times round the frame, within which the needle is suspended, that the effect may be proportionally increased. It differs, however, from all made before it, in the use of two needles instead of one: these are equal in size, parallel to each other, magnetised in opposite directions, and fixed on a straw, so that the contrary ends of the two needles point in the same direction. Their distance from each other on the straw is regulated by the construction of the frame with its covering wire, in and about which they are to move. The frame of M. Nobili is twenty-two lines long, twelve wide and six high. The wire is of copper covered with silk, it is one-fifth of a line in thickness, from twenty-nine to thirty-feet long. It makes seventy-two revolutions about the frame. The needles are twenty-two lines long, three lines wide, a quarter of a line thick, and they are placed on the straw five lines apart from each other. An aperture is made in the tissue formed by the turns of the wire on the upper surface of the galvanometer, by thrusting them from the middle towards each side; the lower

needle on the straw is introduced through this aperture into the interior, in consequence of which the upper needle remains a little above the upper surface of the wire. The aperture is retained open to a certain extent, to allow freedom of motion to the needles and straw, these being suspended in the usual way from the upper extremity of the straw. The graduated circle, on which the deviation is measured, is placed over the wire on the upper surface of the frame, having an aperture in its centre for the free passage of the needle and straw. The upper needle is the index, the lower being visible only from the sides of the instrument.

481. The sensibility of this instrument depends upon the addition of the upper needle. Being magnetised in an opposite direction to the lower one, it almost entirely neutralises the influence of terrestrial magnetism, leaving only so much of directive power as shall induce the whole arrangement to return to a constant position when uninfluenced by electrical currents, and yet combining with the lower needle, to cause deflexion when an electrical current is passing through the wire.

482. As an illustration of the delicacy of the instrument M. Nobili observes, that it is well known if Sebeck's combination of antimony and bismuth be attached to a common galvanometer, and the point of junction be cooled, only a very slight effect is observed on the instrument; whilst, if attached to the new galvanometer, the same influence is sufficient to make the needles revolve several times. If a piece of iron wire, five or six inches long, be used to connect the extremities of the copper wire of the instrument, by twisting the ends together, and one of the points of contact be warmed by touching it with the hand, the needle will move from 0°, and in the first oscillation extend to 90°. Even the mere approximation of the hand to the junction of the metals will produce a deviation of 20°.

483. It is necessary for the delicacy of the instrument that the needles used be magnetised as nearly as possible to the same degree, and two indications have been observed as useful in pointing out when this is the case; the first is the position taken up by the plane of the needles, when left to the earth's influence, this should not be in the plane of the magnetic meridian, but more or less inclined to it; the second is the manner in which the system oscillates about its line of equilibrium. These oscillations should be very slow compared with those of a common needle.

484. In consequence of the situation of the graduated circle above, and not within the frame, the folds of the wire may be brought much nearer to each other than in the common instrument, this renders it more compact, and, from the vicinity of the needle within to the wire, also more powerful. When fixing the graduation the zero should be placed so as to accord with the position of the needles, when left to the earth's influence; this will not be towards the true magnetic north, but will not be far from it, and will always be constant.

485. M. Nobili then offers a very curious illustration of the powers of the instrument:—'It is known,' he says, 'that water usually retains itself at a lower temperature than the ambient air, the difference being sometimes 2°, and resulting from the evaporation of the liquid. If a bar of bismuth be made to join the two extremities of the galvanometer wire, and one of the points of junction be plunged into a cup of water, the needle will immediately deviate several degrees proving that the instrument is capable of measuring the small degree of refrigeration produced by the evaporation of the liquid. I have actually submitted one of my galvanometers for fifteen days to an experiment of this kind, the deviation was about 15° in the morning and evening, but more considerable in the course of the day. This first attempt has made me suppose that the galvanometer might become, in the hands of an attentive and skilful philosopher, a kind of *atmidometer*. If by means of a single couple of different metals, bismuth and copper, a deviation of 15° has been obtained, a much greater one would be produced by employing several pairs, conveniently immersed in the same vessel of water; and, perhaps, one might succeed by increasing the scale of observation, in ascertaining more exactly the diurnal rate of evaporation. I propose, also, to ascertain the effect of a current of air, excited by any means over the surface of the water used in the experiment; it would, without doubt, augment the evaporation, and, by increasing the difference between the temperature of the air and the water, increase the effect on the instrument.

486. The theory of electro-magnetism remains to be illustrated. The phenomena developed were, at first view, not a little perplexing; and it was not till after repeated investigation, that, in 1820, any tangible view of the matter was furnished. The conducting wire was found to exert a magnetic force, not in a direction parallel to the wire itself, nor even in any plane passing through that direction, but in one that was perpendicular to it; and which, if circles were described in this latter plane, having the point at which it intersects the wire for their common centre, would have the direction of tangents to those circles. The following is another mode of conceiving the same thing. Imagine a cylinder of any diameter to envelope the wire,—the wire itself being in the axis; and conceive the surface of the cylinder to be covered on all sides with an infinite number of short lines touching the surface at different points, and situated transversely, that is, at right angles to its length. Suppose these lines to represent magnets, with the northern polarity of each turned in one invariable direction, as we follow them round the cylinder. Then will these imaginary magnets indicate the direction and nature of magnetic forces, which emanate from the fire as long as the stream of Voltaic electricity is passing through it. The particular direction of the transverse, or, as it has been termed, tangential magnetic force will of course depend on that of the electric current in the wire, and may easily be traced in all cases by the recollection of the following fact. Supposing the wire to be in a vertical position—in which case the planes of the tangential forces will be horizontal—and supposing the stream of positive electricity to be

descending along the wire, which of course implies that the negative electricity is ascending, then that polarity which exists in the end of the magnetic needle, which naturally turns to the north, will be impelled round the wire in the circumference of a circle in a direction similar to the motion of the hands of a watch; that is, from the north to the east, and then to the south and west. The south pole of a magnet will of course be impelled in the contrary direction. A magnetic body in the vicinity of the wire will, by the influence of this force, tend to assume a position, shown in fig. 16, similar to one of the tangential lines we have been describing as placed on the cylinder. But further, the tendency of the electric current in the wire is to induce magnetism in soft iron or other bodies capable of receiving it; and the magnetism so reduced has the precise direction already indicated as that which a bar previously magnetised would assume by the influence of the wire. This direction is shown in the figure, where N and S denote respectively the north and south poles of steel bars, situated transversely with respect to a vertical conducting wire, in which the current of positive electricity is descending, as indicated by the arrows.

487. Most of the facts which have been brought to light by Oersted are the immediate consequences of the above general law. Mr. Barlow's enunciation of this law is as follows: he states 'that every particle of the galvanic fluid in the conducting wire acts on every particle of the magnetic fluid in a magnetised needle, with a force varying inversely as the square of the distance; but that the action of the particles of the fluid in the wire is neither to attract nor to repel either poles of a magnetic particle, but a tangential force, which has a tendency to place the poles of either fluid at right angles to those of the other; whereby a magnetic particle, supposing it under the influence of the wire only, would always place itself at right angles to the line let fall from it perpendicular to the wire, and to the direction of the wire itself at that point.'

488. The transverse, or tangential action, which we have been describing is one of so extraordinary a nature, that it can be assimilated to no other principle in nature, of which we have any knowledge. It is not, therefore, surprising that it eluded the observation of former enquirers, although in the keenness of research, they almost stumbled upon the discovery. The fact which occurred to Beccaria, of the production of transverse magnetism in an iron bar, by the electric discharge of a battery, had, in fact, pointed out the precise direction of this inductive force; and the hint, if pursued, would have infallibly led to the discovery which Oersted made fifty years afterwards. It is curious that a circumstance extremely similar is on record, with regard to the observation which conducted Galvani to the discovery of the science which bears his name; namely, the convulsive movements of the muscles of frogs, on taking sparks from a neighbouring prime conductor, charged with electricity. The very same fact had been noticed by Du Verney, about a century before, as appears from a memoir in the History of the French Academy of Sciences, for 1700; but was deemed of no importance.

489. The relation which this new magnetic power bears to the electrical, was also very singular and enigmatical. Considered as a magnet the conducting wire acted differently, according to the side to which magnetic bodies were presented to it. What was attracted by the one side was repelled by the other; and, if the power were conceived to be derived from the impulse of a fluid, that fluid must be circulating perpetually round the wire in a kind of vortex, of which the wire is the axis. The consequence of such a vertiginous motion, as Dr. Wollaston has termed it, in the magnetic fluid, would necessarily, under certain circumstances, produce rotatory motions in the parts of certain combinations of magnets and of wires. The suggestion thus thrown out by Dr. Wollaston was soon after realized, by Mr. Faraday's discovery of the rotatory movements which had been predicted, and which we have already pretty fully described. By employing mercury as part of the Voltaic circuit, and placed so as to allow of perfect freedom of motion in the conducting wire, or in the magnet, according to the nature of the experiment, and so as to obtain the action of one pole only, Mr. Faraday succeded in effecting a variety of rotations, both in the magnet and the wire, in conformity with the law above stated. If the positive electric current be descending along the wire, the north pole of a magnet in its vicinity will revolve round it in the direction indicated by the arrows. As action and re-action are equal and contrary, the wire was seen to revolve round a fixed magnet, in a direction contrary to that in which the magnet would have moved, if the wire had been stationary; but, since these motions are to be estimated on opposite sides of a common centre, the direction in the circumference will remain the same. Thus, as a north pole revolves round a descending positive electric current in the direction of the hands of a watch, a wire in which a similar current is descending, will revolve in the same circular direction round a north pole placed in the centre of its motion.

490. The experiments of Mr. Faraday and professor Barlow, confirmed and extended as they have been by Barlow, Biot, and others, appeared to have conducted us to the most general fact belonging to the science; namely, the tendency to a transverse rotatory motion in the magnetic and electric fluids, when acting freely on each other. This fundamental principle once admitted, all the phenomena that had hitherto been discovered appeared to be easily explicable, and most of them were the immediate and necessary consequence of that principle. There was, indeed, one particular fact, for the discovery of which we are indebted to M. Ampere, to which it was less directly applicable, and which might not, perhaps, have been deduced as one of its results. This distinguished philosopher observed, that when two conducting wires were so arranged as that one or both of them were allowed a certain freedom of motion, they either attracted or repelled each other, according as the electric current which they transmitted was moving in the same or in opposite directions in the two wires.

If, for example, two wires, which are transmitting currents of electricity, be situated within a certain distance, and parallel to each other; and if we suppose the currents of positive electricity to be passing from left to right in both the wires, they will manifest an attraction for each other. The same tendency of attraction will also appear when the positive currents are both moving in the contrary direction, that is, from right to left. But if the current in one wire is moving in a direction opposite to that of the current in the other wire, in that case a repulsive action will take place between the two wires. These were found to be constant and invariable effects of the transmission of electricity along conductors; and they were manifested equally, whether the two currents were obtained from separate Voltaic batteries, or were only two portions of the same current in different parts of its course.

491. To understand Ampére's theory, let us conceive a slender cylinder of iron intersected by an infinite number of planes, perpendicular to the axis, so as to divide it into as many circular discs, successively applied to each other, as represented in the engraving, at fig. 17: let us now imagine that, in consequence of some unknown action among the particles composing these circles, a current of electricity is perpetually circulating in their circumferences, as if they had composed a Voltaic circuit. Let us suppose the direction of these currents to be the same throughout the whole series of circles: the cylinder thus constituted may be considered as a magnetic filament; that extremity in which, when uppermost, the current of positive electricity is moving in a direction contrary to the hands of a watch, being the one which has the northern polarity, that is to say, which will, when suspended as in a compass-needle, point to the north. It is of course to be understood that the current of negative electricity revolves in the opposite direction. A magnet, then, is supposed to consist of an assemblage of similarly-constituted filaments; and, if these postulates be once granted, all the phenomena of magnetism will flow from them as corollaries; the magnetic power will be resolved into the electrical, and be henceforth erased from the list of original physical powers.

492. The facts belonging to the science of electro-magnetism may be classed under five heads:—the first relating to the reciprocal actions of two electric currents when traversing a conducting substance: the second, to the mutual action occurring between electric currents and magnets: the third, to the magnetic action of the earth on electrical currents: the fourth, comprising the actions of magnets on each other: the fifth, the action of the earth on magnets. These two last divisions of the subject constituted what was properly the province of the science of magnetism; the three former having sprung up in consequence of the discovery of Oersted, and being of an intermediate character, had received the name of electro-magnetism. Ampére proposes to comprehend them all under the title of electro-dynamics.

493. Setting out, then, from the primitive fact, that parallel currents attract one another when their directions are the same, and repel one another when opposite, we have to study the law of modification which these forces undergo when the currents deviate from strict parallelism, and are inclined to one another at various angles, and in different planes. It is evident that the whole action of the currents must be the combined result of the actions of all their parts; and that in order to obtain the former, in every possible case, with mathematical precision, it is necessary to ascertain the simple law which governs the action of those elementary portions.

494. It is evident, in the first place, that the action will be in proportion to the intensities of the currents from which that action is derived; and it has been also determined, that the quantity of each action in each element, follows the same law as that of gravitation—namely, that it is inversely proportional to the square of the distance. The action, estimated in the direction of the line drawn from the one elementary portion of electric current to the other, and which, for the sake of convenience, we shall term the line of junction, will be diminished by any obliquity in the direction of either of the currents—in the proportion of the radius to the sine of the angle which such direction forms with the line of junction. If, again, we consider the effects of a current, of which the direction deviates from the plane that passes through the line of junction, and through the direction of the other current, and is situated in another plane, also passing through the line of junction, we shall find that, from being at a maximum when these two planes coincided, it will be reduced to the proportion of the cosine of the angle they form between them. Taking all these considerations, then, into account, and combining them in one formula, we obtain the following, in which $a$ and $b$ denote the respective intensities of the two elementary portions of each current; $d$ their absolute distance from each other, measured of course on the line of junction; $\alpha$, $\beta$, the angles which their respective directions make with the line of junction, and $\gamma$ the angle between two planes, each passing through the direction of the respective current and the line of junction. Then the action of the two currents on each other, estimated in the direction of the line of junction, being expressed by A,

$$A = \frac{ab}{d^2} (\sin. \alpha. \sin. \beta. \cos. \gamma.)$$

495. In the course of this investigation, Ampére found reason to conclude that the formula thus obtained was still only an approximation to the true law; for portions of the same, or o different currents, that were moving at very oblique angles, or even in the same continued line, were observed to exert a certain degree of repulsion on each other: he therefore introduced another term in the formula; and, as he was at first unable to ascertain the amount of its influence, prefixed to it the co-efficient $k$, the value of which was left for future determination. The whole formula will then stand thus:—

$$A = \frac{ab}{d^2} (\sin. \alpha. \sin. \beta. \cos. \gamma. + k. \cos. \alpha. \cos. \beta.$$

496. Ampère at first regarded the value of $k$ as exceedingly small, and thought it might safely be neglected. Subsequent researches have led him to conclude that it was equal to $-\frac{1}{2}$, so that the whole of that term has a negative value when the cosines of the two angles are themselves positive

497. The forces of electro-dynamical action, determined by the law above stated, are subject to the same laws of composition and resolution as all other mechanical forces, and afford, therefore, equal facilities for mathematical investigation. Many consequences important to the theory of particular facts are deducible from this consideration. Thus the action of a small portion of conducting wire, bent into any number of flexures and contorted forms, provided they do not extend to any great space, upon a distant current of electricity, will be equivalent to that of a similar wire proceeding in a straight course between the two extreme points of the contorted wire.

498. Another corollary deducible from the general law is, that the total action of a conducting wire of infinite length upon any portion of an electric current, moving in a direction parallel to the wire, is in the simple inverse ratio of the shortest distance intervening between the two currents—that is, of the line drawn from one to the other, which is perpendicular to both. This consequence had been already deduced by Laplace, and was verified by direct experiment by Biot, as well as by Ampère.

499. Setting out from the simplest case, where a simple attractive or repulsive power is manifested, namely, that in which two currents are rectilineal, and in parallel directions, and in which the action is at its maximum in point of degree, we proceed to consider the variations which a change of inclination will produce. Let us first suppose one of the rectilinear currents, or wire which conveys it, to be inclined, as is shown at fig. 18, at a certain angle, and in a plane which does not pass through the other wire, or channel in which the other current is moving. In this case, a compound force, or at least one that may be resolved into two forces, is called into action. Let us suppose a line $m\,n$, fig. 18, drawn between the points, in each wire, which are the nearest to each other; a line which will, of course, be perpendicular to both the wires, and which may be called the line of junction: the points $m, n$, where this line meets the wires, will divide each wire respectively into two portions. Those portions of the wires, as $a$ and $b$, or $c$ and $d$, in which the currents are both moving, either towards those points or from them, will be attracted towards each other,—an action which will at first tend to turn them on the line of junction $mn$, as an axis, in planes perpendicular to that axis, so as to diminish the angle which they form, and to bring them into the parallel positions indicated by the dotted lines; and will also tend to make the two wires approximate. The former portion of this force, which produces a rotatory action, may be termed a directive force; the latter, which tends to the approach of the wires in the direction of the line of junction, may be termed the approximate force. This last force commences when the two wires are at right angles, and attains its maximum when they are brought by the directive force into a parallel position. When the corresponding portions of the wires, on the contrary, form an obtuse angle, the approximative force is negative, and is so in the greatest degree when the wires are parallel, with their current, moving in opposite directions.

500. This action will be considerably modified if, instead of supposing the two currents to be of equal length, and crossing one another at the line of junction, we take only a very limited portion of a rectilineal current, situated wholly on one side of the other current, which is itself of indefinite length; and we may now, for the sake of greater simplicity, assume them to be both in the same plane. If we analyse the forces which act on each side, and on each part of the limited portion of the current, the one set being attractive and the other repulsive, we shall find that the resultant is a force which will impel it in a direction perpendicular to itself, in the plane common to the currents, and so as to preserve its parallelism; and this will happen, whatever be the angle of inclination of the less current to the greater. Indeed we might show by experiment the direction in which the shorter wires will tend to move by the action of the current in the lower wire, supposed to be of indefinite length. The direction of this progressive tendency will be determined by that of the currents. When they are parallel to each other, they tend to approach or to separate, according as the direction of the currents is similar or dissimilar. When at right angles to each other, and the positive current in the shorter wire is receding from the longer wire, the shorter wire will be urged forwards in the same direction as the positive current is moving in the longer wire; and, vice versâ, it will be urged in the opposite direction when the current of positive electricity is moving towards the longer wire. Such then would be its motion were it free to move in all directions; but, if its motion be limited, in that plane, to a movement of rotation round one of its extremities, the same force will produce its continual revolution, with a uniformly accelerated velocity round this axis; because the force itself is independent of the angle of inclination of the currents, and is, therefore, uniformly exerted during the whole period of its revolution. It is to be observed, however, that the two cases we have here supposed, in which the effec of a straight current of indefinite length can be limited to a small portion of another current on one side only, are such as are not easily realised in practice. The difficulty lies in disposing of the remaining portions of the current, so that they shall not interfere with the effects intended to be produced. The only mode of obtaining this object is to provide for their subdivision and branching off in different directions, at the end which is nearest to the current whose action we are studying; so that these different portions shall act in opposite ways, and thus neutralise each other's effects. This object may be accomplished most conveniently and effectually by allowing the ends of the smaller portions of

wire to dip in mercury; which will not only carry off the stream of electricity in various directions, but also allow of perfect freedom of motion.

501. Let us now investigate the action of currents moving in the circumference of a circle, which may be examined by means of a conducting wire bent into such a form, that its extremities come very near each other, but are prevented from touching by being covered with silk, or other insulating substances. The force acting on such a wire, while it is transmitting electricity by the influence of a rectilineal current in the vicinity, will tend to bring it into such a position, as that its plane shall coincide with that of the rectilineal current, and so that the direction of the currents in the adjacent portions may be the same. In this position, these adjacent portions attract each other, while a repulsion is exerted between the straight current and that in the remoter part of the circle, which moves in the opposite direction. These two forces are, therefore, opposed to each other; but the attractive force prevails, on account of the greater vicinity of the attracting than of the repelling portions. That portion of the original force which made the plane turn upon itself, so as to bring it into parallelism with the straight current, must be regarded as the directive force. It is here composed of two forces, the one attractive, the other repulsive, but which, acting on opposite sides of the axis of rotation, concur in their effect. Thus while the approximative force is the difference of the two forces, the directive force is equal to their sum.

502. It will be easily understood, that forces of a similar kind are the result of the action of the circular current on the straight wire; and that the latter is urged to assume a position in the same plane with the former, and so that the adjacent currents may be in similar directions.

503. The action of a circular current upon a small portion of a straight current at right angles, or otherwise inclined to the plane of the former, and lying wholly on one side of it, will be somewhat modified. If the direction of the straight current, when prolonged, pass near the centre, the forces which act upon it will be nearly balanced, and no re-action will result; if it be near to the circumference the action of the adjacent portion will predominate, and we shall obtain results analogous to those which we have traced with regard to straight wires. Revolving motions will result either in the straight wire or in the circular one, according to their positions, and according to the direction of the fixed points which may limit their movements. The direction of the motion is determined by the circumstances of the approach or recession of the current to or from the same point, as we have before explained.

504. Having considered the action of a circular on a rectilineal current, we may now study the reciprocal action of two circular currents. When the centre of the one lies in the plane of the other circle, a directive force will operate, tending to bring its whole circumference into that plane, and to assume a new position; and when, in this position, the resultant of all the forces which are in operation will be an attraction or a repulsion, according as the currents in the adjacent portions of the circumferences are moving in the same, or in opposite directions.

505. If the two circular currents be situated opposite to each other, so that the centre of the one be in a line perpendicular to the plane of the other, and passing through its centre, similar phenomena will take place with respect to the directive and approximative forces; which will produce, in the first place, a tendency to parallelism, and then either attraction or repulsion. For each position of the centres intermediate to the two former, we shall find a particular position of equilibrium in planes inclined at a certain angle, whose intersection is exterior to the circles themselves. This position of equilibrium is determinate, and excludes the possibility of any continued rotatory or revolving motion.

506. It is an important preliminary to the study of Ampère's theory to obtain correct ideas of the action of the two circular currents upon one another, because such currents are supposed, in his hypothesis, to be the elements of all magnetic action. This magnetic action may be regarded as the resultant of the forces exerted by every part of the circular currents; and as constituting two forces emanating from its centre, and being of an opposite species on each side of the plane of the circle. If we suppose the circle to occupy a vertical plane passing nearly through the eye of the observer, placed without the circle, and the current of positive electricity to be passing downwards on the side next to the spectator, and upwards on the remoter side, then the force exerted on the side to the right of the plane, considered as a magnetic force, will correspond to the northern polarity, or to a polarity belonging to that end of the compass which turns to the north. The force extending to the left, will, of course, correspond to the southern or opposite polarity. When two circular currents are brought together on the sides where similar polarities reside, they repel each other, because the two currents are then moving in opposite directions in each; but, when the dissimilar polarities are presented to each other, attraction takes place, because the currents are then similarly directed.

507. The intensity of all these forces is much increased when the powers of several circles are combined, which may be obtained by bending the conducting wire so as to compose a spiral; the successive coils of which will conspire together in producing the respective polarities on each side: spirals thus constituted act exactly as magnets whose poles might be supposed to be situated in the centre of each disc.

508. But the imitation of magnetic bodies is rendered still more complete, when the turns of the wire are made, not in the same plane, but on the surface of a cylinder, so as to form a helix instead of a spiral. If the wire, after having formed a helix, be bent back so as to return in a straight course in the interior of the cylinder, with the usual precautions against contact, we obtain a very perfect accordance with the theory already examined.

509. We come now to the subject of terrestrial magnetism. If we assume that the action of the solar rays on successive parts of the torrid zone, from east to west, produces currents of positive electricity in that direction, and which may be regarded as collectively circulating in what may be called the magnetic equator; attended, as they must always be, by counter-currents of negative electricity in the same equator, but in the opposite direction; and also that these currents have the same properties and modes of action with all other electrical currents,—then there must result, as a necessary consequence, a twofold polarity, apparently belonging to the earth, and directed to the poles of this magnetic equator.

510. It is to be observed, that as that polarity, which is situated near the north pole of the earth, results from a current moving in a direction similar to that of the hands of a watch, it will have the properties of a southern polarity, in the sense in which we have invariably used the term; that is, it will attract the north pole of a magnet, and repel the south pole; while actions the reverse of this will take place in the southern hemisphere. It is unnecessary to remark, how exactly this theory accords with all the known facts relative to the action of the earth on magnets. The directive power which acts on magnets on the surface of the earth, is the result, not of any real influence proceeding from that part of the earth to which their poles point, but of the action of the currents at the magnetic equator, and the tendency of the currents in the magnet itself to turn it, so that they shall attain the position of equilibrium we have already adverted to, in considering the mutual action of two circular currents. This position is precisely the plane which is perpendicular to the line of magnetic direction; that is, to the axis of the dipping needle: for as the electric currents in the needle are at right angles to its axis, it follows that when they arrange themselves in conformity with the equatorial currents of the earth, that are circulating east and west, that axis and the whole needle will point to the north and south —as we find they actually do.

511. The nature of this influence is more clearly discernible when it is exhibited in its simplest form, on a single circular current, which, as we have seen, may be regarded as the element of a magnet. A conducting-wire bent into the form of a circle, when free to move, always assumes, by the electro-magnetic action of the earth, a position in a plane descending to the south, intersecting the horizon in a line passing east and west, and inclined to it at an angle which is the complement to the dip; that is, in a plane which is perpendicular to the magnetic meridian. Its northern and southern polarities are equally real with that of a magnetic needle; but appertain to an imaginary axis passing through the centre of the circle and perpendicular to its plane. The direction of the currents on its south side, or that nearest the equator, is similar to those in the earth's equator—that is, from east to west (the positive current being always understood as defining the direction). All these circumstances are sufficiently illustrated in the theory we have been endeavouring to explain, and of which we shall furnish experimental data in referring to the apparatus contrived by Mr. Barlow, and employed in the theatre of the London Institution.

512. The same phenomena are observed, if the course of a moveable wire be that of a parallelogram; or, indeed, any plane figure which returns into itself, as well as if it were a circle. By varying these forms, we are enabled to observe and distinguish the effects of the earth's influence on wires which are parallel to the direction of the dip, and on such as are at right angles.

513. The action of the earth on spiral conducting wires is precisely similar in kind to that of single circles, but it is more powerful in degree. Helices are, in like manner, found to obey the terrestrial influence, just as magnets do when placed in similar circumstances as to freedom of motion, provided the electrical currents which they convey are of sufficient intensity. Continued progressive, or even rotatory motion may be obtained by the same influence, in conductors whose motions are limited to certain planes, either in parallel directions, or round an axis. So that, in fact, every experiment that has been tried, and a great variety has been devised by the ingenuity of numerous experimentalists, has served but to confirm the correctness of Ampère's views of the theory of magnetism. It is easy to distinguish whether the motion of any part of a Voltaic circuit is the effect of the influence of the earth, or merely of the other portions of the same circuit, by reversing the communications with the ends of the pile or battery employed: in the former case, the direction of the motion is immediately reversed by this change; and in the latter case, the action continues the same as before.

514. Ampère is far from supposing that the successive action of the solar rays on the equatorial regions of the earth is the sole cause of the electric currents that circulate in them. Internal changes, taking place in the earth itself, must also concur in producing them; for it would otherwise be impossible to account for the observed variations in their effects. The diurnal variations may, however, fairly enough be attributed to the alternate changes of temperature occurring in different parts of the torrid, and even of the temperate zones.

515. The phenomena of magnetic induction, whether effected by currents of electricity passing through a conducting body, or by a magnet in which such currents are assumed to exist, are also in perfect conformity with this hypothesis. A conducting wire tends to the determination of currents in the same direction as those which it conveys itself, in all the magnetisable bodies in its vicinity: these currents continue to circulate with more or less permanency, after the removal of the current which originally determined them. In soft iron they soon disappear: in steel they continue to maintain themselves, and give rise to permanent magnets. The polarities thus induced will have transverse directions with respect to that of the current to which they owe their

origin, for the reasons we have already so fully explained.

516. Numerous facts have induced Ampère to conclude, that the circulation of electric currents peculiar to magnets takes place round each particle of the magnetic body; he has also adopted the opinion that these currents pre-existed, in the bodies susceptible of magnetism, before this property was imparted to them; but, as they were moving in every variety of direction, they neutralised each other, and could produce no external effect. It is only when a determinate direction has been given to them, either by another magnet or by a Voltaic current, that they become capable of exerting any magnetic action.

517. By a very curious experiment, Ampère has proved, that a powerful electric current has a tendency to excite similar currents in neighbouring bodies, not generally susceptible of magnetism. A copper wire of considerable length was rolled round a cylinder, so as to form a coil, all the turns of which were separated from each other by silk riband. Within this spiral coil a ring of brass was freely suspended by a fine metallic thread, passing through a small glass tube, which was placed between the threads of the copper coil. The circumference of the ring, in every part, was thus brought very near to the copper wire, through which a powerful Voltaic current was made to pass. Under these circumstances the brass wire was attracted or repelled by a magnet, in the same way as it would have been had it formed part of the same Voltaic circuit. The action, indeed, was but feeble, and Ampère, in his first trials, failed in his endeavours to render it sensible; but, on persevering in the attempt, his success, at last, was complete and unequivocal.

518. A simple circular current, or what will act still more powerfully, a spiral coil, when presented to a magnet exhibits phenomena precisely analogous to those afforded by the ends of magnets; acting as north poles on one side, and as south poles on the other. If the currents in these spirals be reversed, the polarities on each side are in consequence immediately reversed; what was before a north, now becomes a south pole; and vice versâ.

519. But the simple circular conducting wire or ring exhibits, in consequence of the vacant space in its centre, phenomena which neither the spiral coil, of which the turns occupy the whole disc of the circle, nor any magnetised iron can produce. M. De la Rive contrived, upon this principle, a very pretty and instructive experiment, which is noticed in another part of this article. A floating conducting ring being placed so as to encircle a magnet, but in such a way as that the currents in each did not accord, was repelled along the magnet till it reached its end; when it spontaneously turned half round, and was then attracted by the magnet, again encircled it, and proceeded to settle itself round the middle of its length, where it remained in equilibrio.

520. A still more perfect accordance with magnetic phenomena is presented by the heliacal arrangements which we have denominated Voltaic magnets. These possess regular poles at both ends; the one being north, the other south: which poles are immediately changed into the opposite kinds, by merely reversing the course of the current. They obey the action of magnets which are presented to them, are attracted and repelled, and assume determinate positions with respect to the magnet, just as if they were ordinary magnets: of which, indeed, they possess all the essential properties, and for which they may be substituted in almost every form of experiment.

521. The phenomena of revolving motions, effected either in magnets or in wires, by their mutual action, as first discovered by Mr. Faraday, and as afterwards extended by Ampère, Barlow, Savary and others, and which have been regarded by most philosophers as indicative of the rotatory tendency being an ultimate fact, will be found, on attentive examination, to be not only in strict accordance with, but to be direct consequences of Ampère's theory. Instead of constituting objections to that theory, as was at one time supposed, they have proved, in fact, to be amongst the strongest confirmations of its truth. It would extend this article to too great a length were we to engage in the detail of the circumstances of each experiment, so as to follow all the particular applications of the theory, and trace their agreement with the observed results; but the general principles on which they are to be accounted for have already been sufficiently explained. It is also to be remarked, that Ampère ascertained, by suitable variation in the experiments, that these rotatory movements, although strictly deducible from his own theory of the constitution of magnets, where the action of the portion of conducting wire was alone taken into account, were generally, in a much greater degree, the effect of electric currents taking place in the mercury, into which the extremities of the wire were immersed, and the re-action of which on the wire produced a considerable repelling force. He found it, indeed, as impracticable in mechanism, as it was impossible in theory, to produce rotation without employing fluid conductors in some part of the Voltaic circuit.

522. To take one of the simplest cases of electro-magnetic action, let us suppose a vertical conducting wire, in which the positive current is descending, presented to a magnetic bar suspended by its centre, so as to move freely in a horizontal plane, and which has assumed its usual position in the magnetic meridian by the influence of the earth. In this position, all the currents contained in the magnet are ascending on its western, and descending on its eastern side. The former will therefore be repelled, and the latter attracted by the wire, and the magnet will so arrange itself that the middle of its attracting side shall be opposite to the wire.

523. When two magnets, on the other hand, are presented to each other, end to end, it will depend upon the direction of the currents being similar or dissimilar at the adjacent ends, whether attraction or repulsion will take place; the former happens when the north and south poles are opposite to each other: the latter when simi-

lar poles front each other. The first case may be illustrated by two watches laid the one above the other, so that the dial of the one may be in contact with the back of the other; the hands will then, in both watches, be moving in the same direction. The second case is represented by their being laid face to face, when it will be seen that the motion of the hands are now in opposite directions.

524. But the attractive or repulsive forces are not merely produced by currents at the ends of the mangets; they are the result of the action of all the currents from one end to the other of each magnet. We must regard the total action as composed of the attraction or repulsion of one whole side of the one to one whole side of the other; and of a similar attraction or repulsion between the two other sides: while the contrary action is excited between those respective sides which may be differently grouped. Thus, calling the east and west sides of a magnet the sides which face those points, when its axis is in its natural position in the magnetic meridian, the east side of the one will attract the east side of the other, and repel the west side: the west side will, in like manner, attract the west and repel the east. The tendency of this action is to bring the two eastern sides parallel, and as near to each other as possible: when this position has been attained, the north pole of each magnet will be adjoining to the south pole of the other, and the attractive action will be at its maximum. The same must be understood, mutatis mutandis, of the repulsive action, which is greatest when the east side of the one is parallel and adjoining to the west side of the other; in which case the two poles of the same name in each magnet are adjoining to each other.

525. The attentive consideration of these combinations of forces will explain a difficulty which at first might be apt to startle us. When the north end of one magnet is directly opposed to the south end of another, the adjacent currents run in similar directions, and there is, therefore no difficulty in understanding how attraction takes place: but if the one magnet be moved a little to one side, and brought in a parallel direction, till the two adjacent ends have just past one another, we then find that such a coincidence of adjacent currents no longer takes place: on the contrary the eastern side of the one, where the current is descending, is close to the western side of the other, having an ascending current. Repulsion therefore, as it would seem, should now take the place of attraction: whereas we find that, under these circumstances, the two poles still exert a powerful attraction. The reason, however, will appear when the actions of all the other currents, besides those that are immediately adjacent, are taken into account. It will then be found that the repelling positions belonging to the two magnets are, in consequence of the great obliquity of their actions, much less powerful than the attractive portions, which act at a greater angle.

526. Mr. Buxton has published a new theory of electro-magnetism in a work of Mr. Partington's, to which it may be advisable briefly to call the reader's attention. He says, 'I have at all times been particularly averse to the basis upon which the present theory of electro-magnetism is founded, where there is supposed to exist a strong analogy, if not a comple identity, between the electric and magnetic fluids; and also to the many unnatural modifications which have been resorted to in order to support the above position. I allude to the various routes which the electric fluid has been supposed to take in its transmission through a conductor connected with the two poles of a galvanic battery, in order to account for the deflection of a magnetised needle exposed to its influence, while it is a well-known fact that electricity invariably takes the most direct and shortest route in its transmission through any conducting substance.

527. 'Naturam expellas furcâ tamen usque recurret,' says Horace; and in this instance it is verified. For even with the assistance of these assumptions, and many others, which are not only irreconcileable with the known and established laws of nature, but even incongruous to each other, we are unable to account for many of the most interesting phenomena of the science. It would be wrong to reject any hypothesis without giving some grounds of objection, and I shall therefore endeavour to show, that though these two properties may, in an unqualified sense, be made to agree and to possess similar attributes, yet neither of these argues a physical identity, or even analogy. It is true, they may be made to agree, but this only in a bare definition, inasmuch as they may both be defined to be properties of natural bodies; but this must not be taken as a general definition, as it would lead to the presumption of a co-existence of these two properties in all bodies, whilst, in fact, the metallic bodies are those only wherein they are found in combination: the non-metallic bodies, though evidently possessing the electric principle, seem destitute of the magnetic. Hence we draw our primary distinction, that electricity is a general physical property of all bodies, and that magnetism is a particular property of metals.

528. 'If electricity and magnetism were identical, their phenomena should be similar, and should be exerted under similar circumstances.

529. 'Electricity is capable of exerting attractions and repulsions, and magnetism possesses the same attributes; but this parity exists merely in the unqualified ideas of mere attraction and repulsion, without adverting to the particular circumstances under which these phenomena are made sensible, or the particular objects upon which their influence is exerted.

530. 'Electricity appears to attract all bodies, but repels itself. Thus, when a body in its natural state of electricity is brought within the influence of another body which contains a quantity of the electric principle redundant to its natural capacity, the first body will abstract the fluid from the second, and be attracted by it until they both become similarly electrised, when they will be repelled.

531. 'From these premises, we draw the conclusion that the attractive and repulsive qualities of electricity are dependent upon the different relative proportions of this principle in each containing body, with respect to its capacity, and to the

different relative proportions contained in both bodies with respect to one another.

532. 'But in magnetism these qualities are exerted under a complete dissimilarity of circumstances; for, on two magnetic bodies being brought within the sphere of each other's action, we find that the different parts of the several bodies act differently upon each other; hence, that part of the magnetised body which we denominate the north pole, attracts that part of a similar body denominated the south pole, and, è converso, any two of these similar and corresponding parts in different bodies repel each other. From this we may infer, that the attractions and repulsions exerted by magnetic bodies are dependent upon different modes of action, being exerted in different situations in similar bodies, and not from any difference in the relative proportions of the magnetic principle existing in the different bodies, as is the case in electricity.

533. 'The dissimilar modes of action employed by electricity and magnetism, in exerting their attractive and repulsive qualities, may be elucidated by the following experiment: If a piece of steel, highly magnetised, be brought within a short distance of another piece of steel in its natural state, the latter will be powerfully attracted; and, until being drawn into close contact with the former, they will both exhibit a similarity of magnetic phenomena, and remain in that situation until disturbed by some extrinsic agent. Whereas, in order that these properties of attraction and repulsion exerted by magnetism should coincide in their modes of action with electricity, a mutual attraction should at first take place between the two bodies until both become equally magnetic, when they should be mutually repelled.

534. 'So far I have merely mentioned those properties of electricity which, from a too hasty observation, might appear also to obtain generally in magnetism; but I might adduce many properties in each of these which are not found in the other. This might, however, lead to a disquisition which would form an octavo volume, and I must therefore refrain from trespassing on your valuable pages.

535. 'Though the renouncement of the principle of identity of electricity and magnetism is a sufficient denial of the present theory, it will be found that, even with the admission of this principle, it would be incapable of accounting for many of its most brilliant phenomena. Among these are the interesting experiments of the attraction of two parallel galvanised wires, when the route of the electric fluid is similar; and their repulsion, when the electric fluid in each passes in a contrary direction. Another peculiarity which theorists have been unable either to reconcile or smother, is the fact, that if a piece of soft iron be placed in a tube of glass, and hermetically sealed, the whole being enclosed in a spiral conducting wire, on the galvanic stream passing through the spiral, the enclosed piece of iron will become strongly magnetic; if we admit this as the immediate effect of electricity, we must deny the impermeability of glass by the electric fluid, and with it the theory of the Leyden jar, and in fact endanger the whole science of electricity.

536. 'The admission of an analogy existing between electricity and magnetism, seems the effect of a too superficial observation and hasty conclusion, and the notion seems first to have arisen from the circumstance that lightning has been known sometimes to destroy the polarity of magnetised needles, at others to have magnetised pieces of steel which had not before any sensible magnetic properties. After the observation of these facts, and when the identity of lightning and electricity was afterwards established, it was presumed that common electricity would necessarily produce the same effects: this is found to be the case, and steel may be magnetised either by the Voltaic pile, or by the electric machine.

537. 'But, though electricity is thus capable of exciting magnetism in iron and other metals, still this property is not confined to electricity, for the same effect is produced by filing, drilling, twisting, and several other mechanical means. Electricity ought, therefore, merely to be considered as one of the various means which nature employs to excite the latent magnetic properties of metals.

538. 'Having so far premised, I shall now endeavour to show that the phenomena of electro-magnetism are merely some of the most simple operations of nature, and that they involve no difficulties but what are easily explained by her most simple laws.

539. 'If we admit of magnetism being an essential property of metals, as no magnetic phenomena are sensible to our observation, except under particular circumstances, we must necessarily infer that this property exists in a latent state, which must arise from the natural disposition of the parts of the metal being unsuitable to the circulation of the magnetic fluid; a necessary precedent to any magnetic phenomena.

540. 'That some metals are more easily magnetised than others is a well-known fact, and this frequently obtains in similar metals which have been differently operated upon; this must be ascribed to the above cause, viz.:—to the different organisation of different metals. Thus the latent magnetic principle in steel may not only be brought into action by means of electricity, but the same may be effected by a blow, twisting, &c., and by being rubbed upon an already excited magnet; whilst, to excite the latent magnetic principle inherent in gold, silver, brass, and other metals, the transmission of an electric stream across the metal seems invariably necessary: this, by disturbing the mutual cohesion of the parts of the metal, and by opening a free passage for its own circulation, at the same time, effects a similar arrangement for the circulation of the heretofore latent magnetic fluid.

541. 'If the electric force thus employed be but small, and the parts of the metal through which it has been transmitted not sufficiently removed without their mutual sphere of attraction, the magnetism excited will be but temporary; for, immediately upon the discontinuance of the electric stream, the parts of the metal by their natural attraction will resume their original arrangement, and the magnetic principle will again become quiescent. If, however, the elec-

tric stream, transmitted through the metal be sufficiently strong to effect a total alteration of the relative situation of its parts, the circulation of the magnetic stream will remain constant. However, the permanence of the circulation of the magnetic stream does not seem so much to depend upon the intensity of the electric stream, as to its direction, with respect to the internal structure of the metal through which it has been transmitted.

542. 'Under the impression that all metals contained the magnetic principle in some degree, and also that the conducting wire, connected with the two sides of a battery, is actually magnetic during the transmission of the electric fluid, as is demonstrated by several indubitable experiments, I was led to suppose, that the deflection of a magnetic needle, and the other phenomena of electro-magnetism, were not the immediate effects of electricity, but of the temporary magnetism excited in the conducting wire, during the transmission of the electric fluid.

543. 'With this view, I undertook a series of experiments with different conductors of galvanism (avoiding the metals as being capable of magnetic excitation), supposing that as these non-metallic conductors were incapable of exerting magnetic influence, they would produce no disturbance in the needle during their transmission of the electric fluid; and these expectations were very satisfactorily realised; for on attaching any of these conductors to the poles of the battery, and presenting the needle, not the least sensible deflection was produced; but, on removing these, and substituting metallic conductors, a deflection of 90° immediately ensued.

544. 'In applying this position to electro-magnetism, it will not be necessary to recapitulate the experiments which have not only appeared in most of the journals of science, but have also appeared compiled in a volume. Neither will it be necessary to apply it minutely to any of the experiments, as from its simplicity the experimenter may, by substituting artificial magnets upon a wire, instead of exciting its inherent magnetism by means of the transmission of the electric fluid, perform several of the most pleasing experiments; and this would obtain universally, were he capable of adjusting his magnets with as much precision as is effected by electricity.

545. Before quitting this part of our subject, in which every care has been used to give to each individual experimenter his due proportion of praise, it may be proper to state that electro-magnetism is less indebted to Sir Humphrey Davy than is generally supposed, as will be seen by reference to a note from that distinguished individual to the Editor. He says "you have over-rated what I have done in the science. M. Oersted is the parent, and the very little I have done was a consequence of his original discovery." It must however be borne in mind that Sir Humphrey communicated much valuable information to the Royal Society on the subject, and that most of Mr. Faraday's Apparatus resulted from previous hints furnished by the illustrious President of that Society.

546. When two electrified spheres are made gradually to approach each other, and when there does not exist between the species and the quantities of electricity which they possess, the particular relation which would be established by their contact, the thickness of the electric stratum at the points nearest each other, on the two surfaces, becomes greater and greater, and increases indefinitely as their distance diminishes. It is the same with the pressure exerted by the electricity against the mass of air intercepted between the two spheres; since the pressure, as we have mentioned above, is always proportional to the square of the thickness of the electric strata. It must at last then overcome the resistance of the air, and the fluid, in escaping under the form of a spark or otherwise, must pass, previous to the contact, from the one surface to the other. The fluid thus accumulated, before the spark takes place, is of a different nature, and of nearly equal intensity on each of the spheres. If they are electrified, the one vitreously and the other resinously, it is vitreous in the first and resinous in the second; but when they are both electrified in the same manner, vitreously for example, there arises a decomposition of the combined electricity upon the sphere which contains less of the vitreous fluid than it would have in the case of contact; the resinous electricity, resulting from this decomposition, flows towards the point where the spark is preparing, and, on the contrary, the other sphere, which contains more vitreous electricity than it would have after the contact, remains vitreous over its whole extent.

547. The phenomena are no more the same after the two spheres have been brought in contact together, and are then removed, however little, from each other. The ratio which then exists between the total quantities of electricity with which they are charged, causes to disappear in the expression of the thickness, the term which before became infinitely great for a distance infinitely small, and no spark takes place. The electricity of the points nearest each other upon the two spheres is then very feeble, for very small distances, according to a law which calculation determines, and its intensity is nearly the same on both spheres; but, when they are unequal, this electricity is vitreous on the one, resinous on the other; and it is always upon the smallest that it becomes of a nature contrary to the total electricity, which is conformable to the observations related above.

548. In general, all the varieties of these phenomena depend on the relation which we establish between the radii of the two spheres, and also between the quantities of electricity with which they are charged. We may even determine these proportions in such a manner, that, at a certain distance, the thickness of the electric stratum on the small sphere may be almost constant, so that this sphere may remain near the other, almost as if it were not exposed to any action, not from the weakness of the electricity on the other sphere, but in consequence of a sort of equilibrium which is then established between

its action upon the smallest, and the re-action of this upon itself. In this case, the electricity diffused over the large sphere is vitreous in certain parts, resinous in others, and its thickness in different points presents very considerable variations. M. Poisson has determined the proportions of volume and of electric charge necessary to produce these phenomena; and in this respect, as we have formerly observed, his analysis has anticipated the observations.

549. To complete the case of two electrified spheres, placed in presence of each other, M. Poisson has calculated the changes which the greater or less distance produces on the state of the points most distant from those where the contact takes place. In this respect, he has found, that, in proportion as the two spheres approach each other, the thicknesses of the electric stratum in these points tend more and more towards the values which they would have at the instant of contact. As they arrive at this limit, however, but very slowly, it hence follows, that even at very small distances, they differ yet much from what they would be, if the contact or the spark actually took place. Hence we conclude also, that the spark, when it takes place at a sensible distance, changes suddenly the distribution of the electricity over the whole extent of the two surfaces, from the point where it is produced, even to that which is diametrically opposite. This re-action is easily verified by experiment: we have only to fix, at certain distances from each other, a long and insulated conductor, couples of linen threads, with pith-balls suspended to them, and to communicate to this conductor a certain quantity of electricity, by which the threads may be made to diverge; if we then draw successively, several sparks by the contact of an insulated sphere, whose volume is not too small, all the threads will be observed to be disturbed, and shaken in a manner by each explosion, in whatever part of the conductor it is produced.

550. For the particular case in which the two electrified spheres are removed to a great distance from each other, in relation to the radius of any one of them, M. Poisson has discovered formulæ, which express in a very simple manner the thickness of the electric stratum, in any point of their surfaces. We shall here state these formulæ as they enable us to explain distinctly why conducting bodies, when they are electrified, seem to attract or repel each other, although from the manner in which electricity is distributed among them, and from its mobility in their interior, we cannot suppose that these phenomena indicate any sensible affinity which it has for their substance. Let $r, r'$, represent the radii of the two spheres; call $e, e'$, the thicknesses of the strata which the quantities of electricity they possess would form upon their surfaces if they were left to themselves, and exempt from all external influence; call $a$ the distance of their centres, and place them so far from each other that the radius $r'$ of one of them be very small compared with $a$, and with $a-r$. Lastly, let $u, u'$, denote the angles formed with the distance $a$, by the radii drawn from the centre of each sphere to any point on their surfaces, then the thicknesses E, E′, of the electric stratum in these points will be expressed approximately by the following formulæ:—

$$E = e + \frac{e' r'^2}{a r} - \frac{e' r'^2 (a^2 - r^2)}{r (a^2 - 2 a r \cos. u + r^2)}$$

$$E' = e' - \frac{3 e r^2}{a^2} \cos. u' + \frac{5 e r^2 r'}{2 a^3} (1 - 3 \cos.^2 u')$$

551. Here, as in the experiments of Coulomb, the angles $u, u'$, are reckoned from the points A and $a$, in which the surfaces of the two spheres would touch each other, if we brought them to the point of contact. The difference of symmetry in these expressions is owing to this, that the approximation from which they arise supposes the radius $r'$ of the second, very small compared with the distance $a-r$, which separates its centre from the surface of the other.

552. If it is required, for example, from these formulæ to determine the state of an insulated, but not electrified sphere, which we present to the influence of another sphere charged with a certain quantity of electricity, we have only to suppose $e'$ nothing in the equation of the second sphere, and it will then become

$$E' = \frac{-3 e r^2}{a^2}\left[\cos. u' + (3 \cos.^2 u' - 1)\frac{5 r}{6 a}\right]$$

553. At the point $a$, on the line A$a$, between the two centres, the angle $u'$ is nothing. In this point then we have

$$\cos. u = 1 ; \text{ and } E' = -\frac{3 e r^2}{a^2}\left(1 + \frac{5 r'}{3 a}\right)$$

554. The thickness E′, then, has always a contrary sign to that of $e$, that is to say, that the electricity on this point, in the sphere of which the radius is $r'$, is of a nature contrary to that which covers the sphere of which the radius is $r$.

555. At the point $d$, diametrically opposite to the preceding, the angle $u'$ is equal to 180°, which gives

$$\cos. u' = -1 ; \text{ and } E' = + \frac{3 e r'^2}{a^2}\left(1 - \frac{5 r'}{3 a}\right)$$

556. This value of E′ has always the same sign with that of $e$; for the factor $\frac{5 r'}{3 a}$ is a fraction far smaller than unity, since the distance $a$ is supposed very great, compared with the radius $r'$; then the electric stratum will be in this point of the same nature as upon the other sphere.

557. Thus we see arising out of the theory the important result which we have until now only established by experiment, but while a sphere c, not electrified, is placed in presence of another sphere C, electrified vitreously, for example, the combined electricities of $c$ are partly decomposed; the resinous electricity that results flowing towards the part of $c$ which is nearest to C, and the vitreous electricity towards the part which is farthest from it.

558. The thicknesses of the stratum in these two points are to each other in the ratio of

$$1 + \frac{5 r'}{3 a} \text{ to } 1 - \frac{5 r'}{3 a};$$

they are nearly equal, then, since $a$ is supposed very great in relation to $r'$.

559. Hence it may be conceived that there must be upon the sphere $c$ a series of points, in which the thickness of the electric stratum is

nothing, and which form a curve of separation between the two fluids. The locus of these points will be found by putting the general expression of the thickness E′ equal to zero, which gives the condition

$$0 = \cos. u' + (3\cos.^2 u' - 1)\frac{5r'}{6a}.$$

560. If the distance $a$ were altogether infinite, compared with the radius $r'$, the second member of this equation would be reduced to $\cos. u'$; consequently, this cosine would be 0, which would give $u' = 90°$. The line of separation of the two fluids would then be the circumference of the great circle, of which the plane is perpendicular to the line of the centres.

561. But if $a$ is not infinite, it is at least very great relatively to $r'$. Thus, the factor $\frac{5r'}{6a}$ will still be a very small fraction, and the true value of $\cos. u'$ will be equally so. We may, therefore, in calculating, neglect the product of $\frac{5r'}{6a}$ by $\cos.^2 u'$, compared with the product of this same quantity by unity. With this modification the equation resolves itself and gives

$$\text{Cos. } u' = \frac{5r'}{6a}$$

In this case the line of separation of the two fluids is still a circle whose plane is perpendicular to the line of the centres; but the distance of this plane from the centre of the sphere, in the place of being nothing, is equal to $r' \cos. u'$ or $\frac{5r'^2}{6a}$, this distance being taken from $c$ to $a$, towards the electrified sphere C.

562. In considering only the degree of the equation which determines generally $\cos. u'$, there would seem to be two values of this cosine which would satisfy the conditions of our problem; but it will clearly appear, that one of those roots should necessarily be greater than unity, and, consequently, will not have here any real application, as it would correspond to an arc $u'$, which is imaginary.

563. When we now consider how various, how delicate, and how detached from each other, are the phenomena this theory embraces; with what exactness, also, it represents them, and follows, in a manner, all the windings of experiment, we must be convinced that it is one of the best established in physics, and that it bestows on the real existence of the two electric fluids the highest degree of probability, if not an absolute certainty. But what is not less valuable for science, it teaches us to fix, by exact definitions, the true meaning which we must attach to certain elements of the electrical phenomena, which are too often vaguely enunciated, or even confounded, with others; although the knowledge of each of them, individually, is indispensable to form a correct and general idea of the phenomena.

564. The first of these elements is the *species*, vitreous or resinous, of the electricity which exists at the surface of an electrified body, and at every point of this surface. This is determined by touching it with the proof plane, and presenting this to the needle of the electroscope, already charged with a known species of electricity.

565. The second element is the *quantity* of this electricity accumulated on every point, or, what comes to the same thing, *the thickness of the electric stratum.* This we still measure by touching the body with the proof plane, and communicating the electricity acquired by this contact to the fixed ball of the electric balance; the moveable one having been previously charged with electricity of the same nature. The force of torsion necessary to balance the electric reaction communicated by the plane to the fixed ball, is at equal distances proportional to the quantity of electricity which it possesses, or, what is the same thing, to the thickness of the electric stratum on the element of the surface which it has touched.

566. The third element which it is of importance to consider in the phenomena, is the *attractive or repulsive action* exerted by each element of the electric stratum upon a particle of the fluid situated at its exterior surface or beyond this surface. This attraction or repulsion is directly proportional to the thickness of the electric stratum on the superficial element which attracts or repels, and is inversely proportional to the square of the distance which separates this element from the point attracted or repelled.

567. In fine, the last element to be considered, and which is a consequence of the preceding ones, is the *pressure* which the electricity exerts against the external air in each point of the surface of the electrified body. The intensity of this pressure is proportional to the square of the thickness of the electric stratum.

568. By adhering strictly to these denominations, there will be no risk of falling into error from vague considerations; and if we also keep in mind the development of electricity by influence at a distance, we shall then find no difficulty in explaining all the electric phenomena.

569. To place this truth in its full light, we shall apply it to some general phenomena which, viewed in this manner, can be conceived with perfect clearness, but which, otherwise, do not admit but of vague and embarrassed explications. These phenomena consist in the motions which electrified bodies assume, or tend to assume, when they are placed in presence of each other, and in which they appear as if they really acted upon each other by attraction or by repulsion. But it is extremely difficult to conceive the cause of these movements, when we consider that, according to the experiments, the attraction and repulsion are only exerted between the electric principles themselves, without the material substance of the body, provided it be a conductor, having any influence on their distribution or their displacement. We cannot hence admit, that the particles of the electric principles, whatever they may be, really attract or repel the material particles of the bodies. It is absolutely necessary, therefore, that the attractive and repulsive actions of these principles, whatever they are, be transmitted indirectly to the material bodies, by some mechanism which it is of extreme importance to discover, as it is the true

key to these phenomena. But we shall see that this mechanism consists in the re-action produced by the resistance which the air and non-conducting bodies in general oppose to the passage of electricity.

570. For the sake of greater simplicity, we may first confine ourselves to the consideration of two electrified spheres A and B; the one A fixed, the other B moveable. Three cases may arise which it is necessary to discuss separately.

1. A and B non-conductors.
2. A a non-conductor, B a conductor.
3. A a conductor, and B a conductor.

571. In the first case, the electric particles are fixed upon the bodies A and B, by the unknown force which produces the non-conductibility. Unable to quit these bodies they divide with them the motions which their reciprocal action tends to impress upon themselves.

572. The forces then which may produce the motion of B, are, (1.) The mutual attraction or repulsion of the fluid of A upon the fluid of B. (2.) The repulsion of the fluid of B on itself. But it is demonstrated in mechanics, that the mutual attractions and repulsions exerted by the particles of a system of bodies on each other, cannot impress any motion on its centre of gravity; the effects of this internal action then destroy themselves upon each of the spheres; there cannot result from it any motion of the one towards the other; and the first kind of force, therefore, is the only one to which we need pay any attention. If the electricity is distributed uniformly over every sphere, each of them attracts or repels the other as if its whole electric mass were collected in its centre. Thus, if we call $a$ the distance of their centres; $r, r'$, their radii; $e, e'$, the thicknesses of the electric strata formed upon their surfaces by the quantities of electricity introduced into them; the electric mass of each of them will be $4\pi r^2 e$, $4\pi r'^2 e'$, $\pi$ being the semi-circumference of which the radius is equal to unity, and the attractive or repulsive force will be expressed by $\frac{16\pi^2 K r^2 r'^2 e e'}{a^2}$, K being a co-efficient which expresses the intensity of the force when the quantities $a, e, e'$, are each equal to the unity of their species. This force transmits itself directly to the two spheres, in consequence of the adhesion by which they retain the electric particles. We see, from this expression, that the force must become nothing, if $e$ or $e'$ be nothing, that is, if the one of the two spheres be not primitively charged with electricity. During the motion it suffers no alteration but what arises from the distance, because the two spheres being supposed of a perfectly non-conducting substance, their reciprocal action produces upon them no new development of electricity.

573. In the second case, where A is a non-conductor, and B a conductor, the sphere B suffers a decomposition of its natural electricities by the influence of A. The opposite electricities which result from this decomposition unite with the new quantity which has been introduced, and dispose themselves together according to the laws of the electric equilibrium. Here the motion of B towards A may be regarded under two points of view.

574. Suppose, first, that without disturbing the electric equilibrium of B, we extend over its surface an insulating stratum, solid, without weight, and which may remain invariably attached to it. The electricity of B, unable to escape, will press as it were against this stratum, and, by this means, transmit to the particles of the body the forces by which it is urged. The forces which then act upon the system will be, (1.) The mutual attraction or repulsion of the fluid of A on the fluid of B. (2.) The repulsion of the fluid of B upon itself, a repulsion, however, which cannot produce any motion upon the centre of gravity of B. (3.) The pressure of the fluid of B upon the insulating envelope, a pressure, again, which being exactly counterbalanced by the re-action of this coating, produces still no motion whatever. The first force, then, is still the only one to which we need pay any attention.

575. When the distance $a$ of the two spheres is very great, relatively to the radii of their surfaces, the decomposed electricities of B, are distributed almost equally over the two hemispheres situated on the side of A, and on the opposite. In that case the actions which they suffer on the part of A are nearly equal, and destroy each other; all the force then is produced by the quantities of external electricity, $4\pi r^2 e$, $4\pi r'^2 e'$ introduced into the two spheres, which, acting as if they were wholly collected in their centres, the force becomes still $\frac{16\pi^2 K r^2 r'^2 e e'}{a^2}$.

576. When the two spheres are very far from each other, the co-efficient K may be considered as constant, and the attractive or repulsive force varies not but in consequence of a change in the distance $a$. But this is only an approximation; for, to consider the matter rigorously, the electrical state of the conducting sphere B varies in proportion as it approaches A, on account of the separation which this produces in its natural electricities. Hence also the reciprocal action of the two spheres ought to vary in a very complicated manner, and it is probably to this that we must ascribe the error which appears in the experiments of Coulomb, at very small distances, when calculated by the simple law of the square of the distance.

577. The supposition of an insulating envelope, without weight, serves here merely to connect the electric fluid with the material particles of the body B, and we may always regard as such the little stratum of air with which bodies are ordinarily enveloped, and which adheres to their surfaces. Yet the same result may be obtained without the aid of this intermediary; but, in that case, we must consider the pressures produced upon the air by the electricities which exist at liberty in B. These electricities, in effect, as well those that have been introduced, as those that are decomposed on it, move towards the surface of B, where the air stops them by its pressure, and prevents their escape; they dispose themselves then under this surface, as their mutual action and the influence of the body A require, resting, for this purpose, against the

air, which prevents them from expanding. But, reciprocally, they press this air from within outwards, and tend to fly off with a force proportional to the square of the thickness of the electric stratum in every point. Decompose these pressures in the direction of three rectangular axes of the co-ordinates $x$, $y$, $z$, the one $x$ being in the direction of the straight line already alluded to, joining the centres of the two spheres, and add together all the partial sums; it will then be found, as we shall show presently, that, in the direction of the co-ordinates $y$ and $z$, they amount to nothing, and there only remains, therefore, a single resulting force, directed in the straight line C $c$, that is, towards the centre of the sphere A. When the spheres are very distant from each other, compared with the radii of their surfaces, the decomposed electricities of B press the external air, in opposite directions, with a force nearly equal, and their effects destroy each other almost exactly. There only remains, then, the effect of the quantities $e$, $e'$, introduced into the two spheres, and from this there results an excess of pressure in the direction of the lines of the centres, and expressed by $\frac{K\,e\,e'}{a^2}$, K being a constant quantity for the two spheres, that is, exactly the same as was obtained by the other method. It is evident, besides, that this expression is subject to the same limitation, since the pressures produced by the electric stratum against the external air, ought to vary with the quantity of natural electricity decomposed on B by the influence of A, in proportion as the two spheres approach each other.

578. The third case in which A and B are both conductors, is resolved exactly upon the same principles, either by imagining the two electrified surfaces covered with an insulating envelope, and calculating the reciprocal actions of the two fluids which are transmitted by means of this cover to the material particles; or in considering the pressures produced on the external air by the two electric strata, and calculating the excess of these pressures in the direction of the line which joins the two centres; only, in this case, the attractive or repulsive force of these two spheres will vary in proportion as they approach each other, not only by the difference which thence arises in the intensity of the electric action, but still farther by the decomposition of the natural electricities which will be going on in the two conducting bodies A and B.

579. To render the mathematical exactness of these considerations evident, we shall, for the preceding case, go through the calculation of the pressures exerted against the air by the quantities of electricity introduced or developed on the two spheres. For this purpose take, first, on the sphere A, any point whatever which we may denote by M. The pressure exerted at this point against the air, depends on the thickness of the electric stratum there. In this manner, the pressure for any point of either sphere calculated for the unity of the surface, will be represented by $k\,E^2$ upon the first, and $k\,E'^2$ upon the second, E E' being taken from the previous formulæ. We shall now develope, successively, these two expressions. In the first place, as the pressure $k\,E^2$ varies from one point to another with the thickness of the electric stratum, we cannot suppose it the same, but in a very small space all round the point M, a space which must be considered as a superficial element of the sphere, and which we shall call $\omega$; thus the expression K E² being calculated for the unity of surface, the pressure upon the small superficial element $\omega$ will be $K\,\omega\,E^2$. This pressure acts perpendicularly to the spherical surface A, in the direction of the radius C M; decompose it then into three others, parallel to three axes of the rectangular co-ordinates $x, y, z$, which have their origin at the centre C; the first, $x$, being in the direction of the straight line, C $c$, which joins the centres of the spheres, and the two others perpendicular to this line. To effect this decomposition, we must multiply the normal pressure K E² by the cosines of the angles which the radius C M forms with the co-ordinates $x, y, z$; that is, by $\frac{x}{r}$, $\frac{y}{r}$, $\frac{z}{r}$ since, in the formula of p. 84, we have represented by $r$ the value of the radius C M of the sphere A. We shall thus have the three following component parts

parallel to the co-ordinates $x$; $K \frac{x}{r} \quad E^2$

parallel to the co-ordinates $y$; $K \frac{y}{r}\,\omega\,E^2$

parallel to the co-ordinates $z$; $K \frac{z}{r}\,\omega\,E^2$

But we must observe, first, that it is absolutely of no use paying any attention to the two last, because the efforts which each of them makes, on the whole extent of the surface, mutually destroy each other, on account of the symmetrical disposition of the electricity relatively to the axis of the co-ordinates $x$, which joins the two centres. If we consider, in effect, the force, for example, $K \frac{z}{r}\omega\,E^2$ for the point M, situated in the figure under the plane of the co-ordinates $x, y$, we shall find above this plane, another point M′ situated quite similarly, and of which the co-ordinates $x$, $y$, $z$, will consequently be the same, with this only difference, that $z$ will there be negative, on account of its opposite situation relative to the origin of the co-ordinates. For this second point, the element $\omega$, and the pressure K E², will be also absolutely the same; $\omega$ on account of the symmetry of the surface of the sphere A; E² on account of the symmetrical disposition of the electricity round the axis of the co-ordinates $x$, which joins the centres of the two spheres A and B; but the component force which proceeds parallel to the co-ordinates $z$, will be $-\,K \frac{z}{r}\omega\,E^2$, on account of the negative sign of $z$; this force and its analogous one $+\,K \frac{z}{r}\omega\,E^2$ being equal, and in opposite directions, will mutually destroy each other, and a similar equilibrium will be equally obtained, in this kind of pressure, for all the other couples of points M, M′. which correspond on the two sides of the plane of $x, y$.

581. A similar process of reasoning will prove that the forces $K \frac{y}{r}\omega\,E^2$ will destroy each other two

and two, upon corresponding points, taken on two sides of the plane of $x$, $z$, and of which the co-ordinates will be $+x$, $+y$, $+z$ for the one, and $+x$, $-y+z$ for the other.

582. It remains, then, to consider the components of the pressures, taken parallel to the co-ordinates $x$; that is, parallel to the straight line which joins the centres C$c$, of the two spheres; and, indeed, from the symmetrical disposition of electricity round the straight line, it is evident that it cannot have any motion but in this single direction; and, consequently, these components alone must produce the tendency of the two spheres towards each other.

583. To obtain, in the simplest manner, the sum of all these components, it must be remarked, that their general expression $K\frac{x}{r}\omega E^2$ contains no variable but $x$; for cos. $u$, which enters into the value of $E^2$ is equal to $\frac{x}{r}$; it hence follows that their intensities are equal in the points relatively to which the co-ordinate $x$ is the same, and which are consequently situated upon one small circle, parallel to the plane of the co-ordinates $y$, $z$. Besides, as all these points are equally distant from the line of the centres, it is clear that the total result of the equal forces which are applied to them will be in the direction of this line; consequently, this will also be the direction of the general result of all the efforts of this kind exerted upon the whole surface of the sphere A.

584. To obtain now, easily, the sum of all these forces, parallel to the line of the centres, which is here that of the co-ordinates $x$, let us begin by joining together the values of $x$ which are equal and contrary; for the thicknesses E, of the electric stratum on the two hemispheres of A being almost equal, from the supposition that the two spheres are very distant, the pressures corresponding to opposite values $+x$ and $-x$, must be almost equal also; and, as the components which they give parallel to the co-ordinates $x$ are in a contrary direction, their sum must be reduced to a very small quantity. To introduce this circumstance, call E, what E becomes when we change $+x$ into $-x$; then the expressions of the corresponding components parallel to the co-ordinates $x$ will be,

| | | |
|---|---|---|
| On the side of the positive co-ordinates $x$, | $+K\frac{x}{r}\omega E^2$ | Tending to move the air in the direction A B |
| On the side of the negative co-ordinates $-x$, | $-K\frac{x}{r}\omega E^2$ | Tending to move the air in the direction B A |

585. We preserve the superficial element $\omega$ always of the same value, as it is exactly alike in the two cases; on account of the symmetrical form of the sphere on the two sides of the plane of the co-ordinates $y$, $z$; adding these two components to each other, with their actual sign, their sum will express the element of the total resulting force, which tends to carry the air in the direction A B. This, then, will be

$K\frac{x}{r}\omega(E^2-E^2)$, or, what is the same thing,

$$K\frac{x}{r}\omega(E+E)(E-E).$$

586. But, from the preceding formula, we have generally

$$E=e+\frac{e'r'^2}{ar}-\frac{e'r'^2(a^2-r^2)}{r(a^2-2ar\cos.a+r^2)^{\frac{3}{2}}}$$

To change $+x$ into $-x$, $+\cos.u$ must become $-\cos.u$, because $\cos.u=\frac{x}{r}$; for this second case, then, we shall have

$$E=e+\frac{e'r'^2}{ar}-\frac{e'r'^2(a^2-r^2)}{r(a^2+2ar\cos.u+r^2)^{\frac{3}{2}}};$$

consequently, by subtracting these equations from each other, we have

$$E-E=\frac{e'r'^2(a^2-r^2)}{r}\left\{\frac{1}{(a^2+2ar\cos.u+r^2)^{\frac{3}{2}}}-\frac{1}{(a^2-2ar\cos.u+r^2)^{\frac{3}{2}}}\right\}$$

or, what is the same thing, and is better adapted for approximations,

$$E-E=\frac{e'r'^2}{ar}\left(1-\frac{r^2}{a^2}\right)\left\{\frac{1}{\left(1+\frac{2r}{a}\cos.u+\frac{r^2}{a^2}\right)^{\frac{3}{2}}}-\frac{1}{\left(1-\frac{2r}{a}\cos.u+\frac{r^2}{a^2}\right)^{\frac{3}{2}}}\right\}$$

587. Since we suppose the two spheres very distant from each other, compared with the magnitude of their radii, $\frac{r}{a}$ will be a very small fraction; hence we may develope this expression for E—E into a converging series of the ascending powers of $\frac{r}{a}$, this will be effected by the binomial theorem; and taking only the first power of $\frac{r}{a}$, which, in the case we are considering, will contain an infinitely great proportion of the total result, compared with the other powers, it will become

$$E-E=\frac{e'r'^2}{ar}\left\{1-\frac{3r}{a}\cos.u-1-\frac{3r}{a}\cos.u\right\}$$

or by reduction $E-E=\frac{-6r'^2}{a^2}\cos.u$

This value of E—E must now be multiplied by E + E, to form the factor $E^2-E^2$ which enters into the expression of the total resulting force; but since E—E is already of the order $\frac{r'^2}{a^2}$, it is evident that, in E + E we must confine ourselves to the terms which are not divided by $a$; this limitation reduces the value of E + E to $2e$, and employing this to multiply E—E, there results

$$E^2-E^2=\frac{-12ee'r'^2}{a^2}\cos.u.$$

588. It only remains to substitute this value in the expression of the resulting force parallel to the co-ordinates $x$, which we have found equal to $\frac{Kx\omega}{r}(E^2-E^2)$ for the superficial element $\omega$; and by putting for $\frac{x}{r}$ its value cos. $u$, the expression will become

$$\frac{-12Kee'r'^2}{a^2}\omega\cos.^2u.$$

589. Each of these partial results is proportional to the superficial element $\omega$, and to the square of the cosine of the angle, which these elements form with the axis of the co-ordinates $x$. But, if we compare them together upon different spheres, this angle will always be expressed by the same values; for the equal values of $u$, however, the superficial element $\omega$ will vary in magnitude proportionally to the square of the radius $r$ of the sphere. Consequently, the sum of all the values of the factor $\omega \cos.^2 u$, extended to every sphere, will only vary from each other in the ratio of the square $r^2$; it may be represented then by $K'r^2$, $K'$ being a constant and numerical co-efficient which may be found, and which, in reality, is found by the processes of the integral calculus. Supposing it known then, the total result of the pressures parallel to the co-ordinates $x$ will be $\frac{-12KK'ee'r^2r'^2}{a^2}$. (1)

It will be directly proportional then to the quantities $4\pi r^2 e$, $4\pi r'^2 e'$ of external electricity which they possess, and inversely proportional to the square of the distance of the two centres. When the quantities of electricity given to the two spheres are of the same nature, whether vitreous or resinous, the values of $e$ and of $e'$ must be considered as having the same sign. In that case the expression (1) is negative; that is to say, according to what has been previously admitted, that, in this case, the air which surrounds the sphere A, is more pressed in the direction B A, than in the direction A B. It will not then press equally the sphere A, as it did before it was electrified; it will press it less on the side which is most distant from the other sphere, since it is in that direction that the electric reaction is the strongest. Consequently, if the sphere A is at liberty to move, and deprived of its weight, or if its weight be sustained by a thread of suspension, it will put itself in motion from the side where the atmospheric pressure has become the weakest, that is to say, that it will recede from the other sphere B.

590. The contrary would happen, according to our formula, if the quantities $e$, $e'$, of electricity introduced into the two spheres were of a different nature, for then it would be necessary in the calculation to give to them different signs. The formula (1), which represents the total result of the pressures exerted against the air parallel to the line of the centres, will then become positive; that is to say, according to what has been already agreed on, the external air will be more pressed in the direction A B, than in that of B A; the sphere A will move then in the direction in which the external pressure will have become the weakest, that is towards the sphere B, agreeably to observation.

591. We have hitherto only considered the effect of the pressures round the sphere A, but the same reasonings and calculations will apply to the other sphere; only we must then employ, instead of E and E, the expressions of the electric strata which correspond to them, and which we have seen to be

$$E' = e' - \frac{3er^2}{a^2}\cos.u' + \frac{5er^2r'}{2a^3}(1 - 3\cos.^2 u').$$

It might be shown for this case, as well as for the other, that there cannot be any inequality of pressure but in the direction of the co-ordinates $x$; then comparing the points of the surface, which correspond to the two sides of the plane of the co-ordinates $y, z$, we shall find that the element of the resulting force of the pressures parallel to the co-ordinates $x$, is in general expressed by $\frac{Kx\omega'}{r'}(E'^2 - E'^2)$ in representing by $E'$ what $E'$ becomes when we change $+x$ into $-x$, that is to say, $+\cos. u$ into $-\cos. u'$, the angle $u'$ being here reckoned from the point $a$, situated on the side of A upon the line of the centres. By next considering the spheres as very distant, we shall obtain in the same manner the value of $E' - E'$. Approximating no farther than the first power of $\frac{r'}{a}$, this will give $E' - E' = \frac{-6er'}{a^2}\cos. u'$. We have then only to take $E + E' = 2e'$, and putting these values in the expressions of the partial resulting force, it will become $\frac{-12Kee'r^2\omega' \cos.^2 u'}{a^2}$. It may be demonstrated as above, that the sum of the factors $\omega' \cos.^2 u'$ will be proportional to the square of the radius of the sphere B, and may besides be represented by $K'r'^2$; $K'$ being the same numerical co-efficient we have already employed. For the total resulting force then, the expression will finally become $\frac{-12KK'ee'r^2r'^2}{a^2}$, that is, exactly the same which we have obtained for the other sphere, which ought to be the case, since in these sort of phenomena action and re-action are always equal. Here, as in the example immediately above, the positive sign of the expression will signify that the resulting force of the pressures exerted against the air round the sphere B, is directed towards the other sphere, and the negative sign will signify that this resulting force is directed the opposite way. The first case will take place when the electric charges $e\,e'$ are of a contrary nature; in that case, the sphere B will advance from the side where the atmospheric pressure is weakest, that is towards A; the other case will happen when the electric charges $e\,e'$ are of the same nature, then B will recede from A.

592. The common expression for the result of the pressures vanishes for both the spheres, when $e$ or $e'$ is nothing, that is, when one of them is in the natural state. This seems to indicate that they would then neither approach nor recede from each other, while, in reality, we know that in this case they always approach. This apparent contradiction is owing to the degree of approximation at which we stopped our development of the above expression. We have supposed our two spheres very distant from each other, compared with the radii of their surfaces; the result of this is, that whatever be the quantity $4\pi r^2 e$, $4\pi r'^2 e'$ of external electricity which we have introduced into each of them, it will distribute itself almost uniformly over the two hemispneres, anterior and posterior; so that the

difference of the pressures exerted against the air by these two hemispheres, which is the only cause of motion, will be very small; and it is to this degree of minuteness that we have confined our approximations in developing $E'^2 - E_{,}'^2$.

593. If, however, the one of the two spheres, B for example, is only electrified by the influence of the other, which we always suppose very distant, the development of its natural electricities will be still very feeble, and of the same order of minuteness with that to which we have confined our approximations; but this weak electricity still dividing itself between the two hemispheres of B, in a manner nearly equal, as in the example immediately above, the difference of pressures round the two hemispheres will become very minute in a still lower degree—will become a quantity of the second order of minuteness, and, consequently, cannot be found in our developments, such as we have limited them. To obtain it complete, we must not, in the calculation of $E' + E_{,}'$ confine ourselves to quantities, independent of $\frac{r'}{a}$, but take its whole value. We shall then have, first of all,

$$E' = e' - \frac{3er^2}{a^2} \cos. u' + \frac{5er^2r'}{2a^3} (1 - 3 \cos.^2 u')$$

then changing $+x$ into $-x$, or $+\cos. u'$ into $-\cos. u'$, we shall have,

$$E_{,}' = e' + \frac{3er^2 \cos. u'}{a^3} + \frac{5er^2r'}{2a^3} (1 - 3 \cos.^2 u')$$

then adding these two expressions,

$$E' + E_{,}' = 2e' + \frac{5er^2}{} (1 - 3 \cos.^2 u').$$

594. This complete value of $E' + E_{,}'$ will now no more vanish when $e'$ is nothing; but it will be seen that the terms which remain are of the order of those which we have neglected in our first approximation. Making, then, here $e'$ equal to nothing, it remains,

$$E' + E_{,}' = \frac{5er^2r'}{a^3} (1 - 3 \cos.^2 u')$$

we also find, as before,

$$E' - E_{,}' = - \frac{6er^2}{a^2} \cos. u'$$

with these values, the expression of the partial resulting force

$$\frac{Kx\omega'}{r'}(E'^2 - E_{,}'^2), \text{ or } K\omega'(E'^2 - E_{,}'^2) \cos. u'$$

becomes $\frac{-30Ke^2r^4r'}{a^5} . \omega' \cos.^2 u' (1 - 3 \cos.^2 u')$.

595. It only remains to take the sum of it over all the extent of the surface of the sphere B; but, in this operation, the variable factor, $\omega' \cos.^2 u' (1 - 3 \cos.^2 u')$, will give a result proportional to the square of the radius $r'$ of the sphere B, and which we may consequently represent by $K'' r'^2$, $K''$ being a constant numerical co-efficient different from $K'$; thus, the total resulting force will at last be $\frac{-30KK''e^2r^4r'^3}{a^5}$.

596. This force, then, will be an order of minuteness, much inferior to that which we obtained at first, when $e'$ was not supposed to be nothing, since the radii there are divided by the fifth power of the distance of the centres of the two spheres, instead of the simple square which we had in the other approximation. It is obvious, that experiments of this kind, made with the electric balance, by charging only one of the balls, might produce an error as to the true law of the phenomena, if the theory did not throw light upon them; for one might be led to conclude from them, that the apparent attraction determined in this case is not reciprocally as the square of the distance of the centres of the two spheres, which nevertheless would be contrary to the truth: consequently, when it is meant to put this simple law of the square to the test, the balls must not be allowed to approach so near to each other, that the electricity developed by their reciprocal influence, may bear any sensible proportion to the quantities of external electricity introduced into them; and this is the reason that, in these experiments, it is always more certain to employ, instead of balls, small circular discs of gilt paper; for, on account of the thinness of these discs, the quantities of vitreous or resinous electricity developed at their surfaces, having scarcely any room to separate from each other, their actions on the exterior bodies must be always nearly alike, and cannot, therefore, alter the results any more than if their development had not taken place.

597. The theory, which we have thus explained in regard to spheres, applies equally well to bodies of any form whatever; but here the difficulty of the analysis prevents us from anticipating any thing but the general effects which the different pressures produce, without our being able to reduce them to numbers. Here it will suffice to have established the general mode of reasoning applicable to all the questions of this kind, and to have followed out the whole development for the single case, which analysis has been able as yet completely to surmount.—We shall add, that before the theory had acquired its actual precision, it could not be clearly conceived how the attractions and repulsions, which in reality only take place between the electrical principles themselves, were communicated to the material particles of the electrified bodies; and philosophers were reduced to the necessity of denoting this effect by the vague word *tension*, which represented the electricity like a kind of spring placed between the bodies and tending to make them approach or recede. A few miscellaneous illustrations, including the latest and most important discoveries, must conclude our article.

### New Galvanic Battery for Medical purposes.

598. The object of this battery is to increase the galvanic power, ad libitum, and to continue it for a great length of time, without any fresh excitation. These most desirable results are effected by a metallic and a semi-metallic substance, combined with another less oxidable metal, the surfaces of which are acted on by one or two mineral acids diluted with pure water. The power and duration obtained by these means are very great, though contrary to the hitherto acknowledged laws of galvanism, which require

two dissimilar metals and one interposed fluid to develope the galvanic influence. This apparatus is designed for philosophical experiments on animals, and for the use of an operator in full practice. It is not only capable of increased power, but, by a simple contrivance, it perpetuates its action to almost any length of time for a succession of operations; these advantages are obtained by the shape and position of the plates; for, instead of being square and stationary, as in the common battery, they are circular and made to revolve on an axis at the will of the operator. As only one segment of the circle is used at one time, several different operations may be effected in each revolution of the entire circle, without the trouble of wiping any part of the circle. A constant stream of galvanic fluid may thus be exhibited almost ad infinitum, and the unpleasant effluvia arising from the frequent addition of acid, as in the common mode, is prevented. The apparatus being concealed from view, in a handsome covered box, cannot give alarm to the most timid patient. The greatest facility is afforded in removing the oxide from the surfaces of the plates by a few revolutions round its axis, and the virtue of the acid solution in the cells remains in full strength for a very long time.

599. M. La Beaume's portable galvanic battery consists of a box containing four series of plates, and four divisions made with pieces of glass and baked wood, which are interposed to divide the box for the plates; the ends of each series are connected by a hole in the plates, so that a connecting wire is not required. There is also a space for a bottle of acid. The inside of the box cover contains the apparatus necessary for the galvanic operation. By a few simple directions the battery may be preserved in good order for some months, or even years. The cover, after the apparatus is taken out of it, is placed on the box, and, sliding into a groove, is fastened by a pin.

600. Another portable galvanic battery for suspended animation. This apparatus possesses a very great galvanic power in a small compass, and its action can be perpetuated for as long a time as may be necessary, which is accomplished by the combination of different metals. It consists of 300 or 400 plates in a box about three feet long, three inches deep, and three inches wide; the circular plates are about the size of half a crown, and when the apparatus is taken out, the box is filled with diluted nitric acid, and the row of stringed plates is placed horizontally on the two supports of the battery.

601. A third portable galvanic battery intended to be used in suspended animation from drowning, &c., is contained in a walking-stick, for the convenience of town or country practitioners, when no conveyance can be immediately obtained for a larger battery. This galvanic apparatus is contained in a hollow stick, with three divisions; the first division contains a bottle of acid, salt, and linen rag, covered by a metal cap affixed to the handle of the stick, and which is to be used as a cup to mix the acid with water. The second division is composed of two parts, one sliding on the other by means of a groove; when opened, it forms a pair of galvanic batteries of 300 or 400 plates of combined metal, which are connected together by an arched wire. The third division, which is the smaller end of the stick, contains a small lancet, the conducting wires, &c., and is also held by the hand during the operation. This stick contains all that is necessary for the galvanic process except water, which can be obtained on the spot. The power of this battery is rendered equal to the following, by the combination of the plates, the strength of the acid, and the horizontal position of the plates, which prevents the circuit of communication being formed by the expressed moisture of the interposed cloths, which must result from a perpendicular position of the pensile pile, as invented by professor Aldini, and improved by Dr. de Sanctis.

602. The most portable battery consists of a series of plates of the form and size of a shilling or a sixpence; each pair being intersected by a piece of cloth, on the principle of professor Aldini; and this battery is more powerful than his, because the semi-metal is combined with one of the other metals. This battery consists of 200 or 300 plates, and may be conveyed with perfect ease in the pocket.

### Electricity developed in Capillary Attraction.

603. M. Becquerel is said to have demonstrated, that there is a sensible development of electricity during the ascent of liquids in capillary tubes. He first obtained this result by increasing the sensibility of Schweigger's galvanometer. He placed three of these instruments together, so that the magnetic needle of the middle one deviates from its ordinary direction, by the lateral effects produced upon each of its poles by the contrary poles of the two other needles. From this arrangement it follows, that, when an electric current passes into the apparatus, tending to bring the needle into the plane of the magnetic meridian, the middle needle will be as much less retarded in its process as the poles, opposite to its own, of the other two needles are more remote from it, consequently, the oscillations will have a wider extent than if there were only one galvanometer.

604. In order to observe the electricity of capillary action, M. Bacquerel could not employ glass, as it is not a conductor of electricity; but he employed sponge of platinum, and small pieces of charcoal. Pure hydrochloric acid, much diluted with water, is poured out into the platinum dish, which communicates with one of the ends of the wire of the galvanometer; and into the dish is plunged sponge of platinum, which is fixed at the other end of the wire. At this contact there is produced an electric current, which goes from the sponge to the acid, and the direction of which is contrary to that of the current which would have been obtained if the acid had been attacked by the metal. As the interstices of the sponge are filled with the fluid, the current diminishes, and it ceases when the sponge has absorbed all the liquid which it can contain. Sometimes the current takes another direction, but the cause of that is not known.

The same effect is produced with nitric acid, but it is less marked. The same result was obtained with a small piece of charcoal, prevented from touching the platinum by a band of papier Joseph.

### Electricity developed in Solutions and Mixtures.

605. By means of the same apparatus, M. Becquerel has discovered that an electrical current goes from the acid to the water, when sponge of platinum, that has imbibed distilled water, is plunged into the dish of platinum, containing hydrochloric acid.

606. In order to observe the electricity of solutions of alkalies in water, he fixed in the platina pincers a fragment of hydrate of potassa or soda, enveloped in papier Joseph, and then plunged it into distilled water in the platina cup. A current was thus produced from the water to the alkali.

607. M. Becquerel also found that electricity was developed during the mixture of sulphuric and nitric acids.

### Electrical Effect.

608. The following effect is attributed by Mr. Fox, who observed it, to electricity. A piece of iron pyrites was fastened with a piece of brass wire in a moss-house, the moss being damp. On the following day, the wire was found broken and excessively brittle, and, in those parts in contact with the pyrites, much corroded. On one occasion, after the brass wire had been fastened once or twice round a piece of iron pyrites, and had remained for some days enveloped in damp linen, the constituents of the brass wire were separated, and it was converted into copper wire coated with zinc.

### Conduction of Electricity by Amadou.

609. It is remarked, in a late number of the Journal de Physique, that the effect of a piece of amadou, in drawing off electricity from charged surfaces, is equal to that of a metallic point. For this purpose, it requires to be dry; and, it may be observed, that at the time a number of fibres rise up and point towards the electrified surface. For the rapid abstraction of electricity, it requires, however, that besides offering points, the body should possess a high conducting power, which was not previously known to belong to this substance.

### Effect of Voltaic Electricity upon Alcohol.

610. M. Lindersdorff produced an ethereal fluid by the action of the Voltaic pile upon alcohol; and, by continued electrisation, a mixture of equal parts of alcohol and liquid ammonia lost its inflammability, and acquired a bitter flavor, yellow color, and nauseous odor.

### Improvement upon the dry Pile of Zamboni.

611. In constructing the dry galvanic pile of Zamboni with tinned paper and black oxide of manganese, M. Zamboni recommends the use of tinned paper, which, when disposed alone in the pile, has the same polarity as when it is employed along with oxide of manganese. The reason of this is, that a pile of tinned paper has electrical poles. But, whatever be the kind of paper which is used, the pile always increases in energy, and its polarity always coincides with that of a pile of tinned paper and oxide of manganese, when the paper has been impregnated with a solution of sulphate of zinc, and afterwards dried. In preparing the paper, M. Zamboni avails himself of a dry season. He spreads the solution of sulphate of zinc over the face of the paper which is not covered with tin, and having dried it, but without taking away from the paper its own natural humidity, he covers this face with very dry oxide of manganese. The pile being thus constructed, it is carefully defended from the air. If the paper is not fine and unsized, a little alcohol should be added to the solution of sulphate of zinc. The best manner of preserving the pile, as Zamboni has ascertained by long experience, is to enclose it in a glass tube, whose diameter is somewhat greater than that of the discs, and to run into the intermediate space a moderately warm cement of wax and turpentine. A pile of 2000 discs, constructed in this manner, gives a spark visible in day-light. M. Zamboni recommends the perfect insulation of all the parts of the pile that require to be insulated.

### Thermo-Electricity.

612. It was proved, by professor Sebeck, that antimony, brought into contact with another metal, and unequally heated, would cause the magnetic needle to deviate from its meridian. With a view to ascertain this fact, and to investigate whether this property was restricted to antimony, or extended to other metals, the following experiments were made.

613. (1.) A parallopiped of antimony was procured, about fifteen inches long, and one inch square. This bar was prepared by treating crude antimony with sulphate of potassa and tartrate of potassa. A slip of copper was attached to both ends of the antimony. It was kept in close contact with the antimony by means of copper rings. This bar was laid in the direction of the magnetic meridian. A needle was placed on the antimony, and the ends of the bar were successively heated by a spirit-lamp. When the heat was thus applied to the south end, the magnetic needle immediately, and strongly, deviated to the east. The extent of this deviation depends on the length, mobility, and strength of the needle. It has been seen as much as 68°. When the heat spreads more uniformly through the metal, the deviation decreases, and the needle gradually returns to the magnetic meridian.

614. Supposing the deviation to the east at its maximum, the lamp burning under the end facing the south, if it then be removed, and placed under the end facing the north, the deviation to the east will decrease, and it will change into a deviation to the west.

615. In general, if the heat is applied under the north end of the bar, the needle will deviate to the west.

### Professor Cumming's Table of Thermo-Electrics.

616. In the following table of thermo-electrics, by professor Cumming, each substance is positive to all below, and negative to all above it, two being used together.

| | | | |
|---|---|---|---|
| Bismuth, | Cobalt, | Brass, | Charcoal, |
| Mercury, | Silver, | Copper, | Plumbago, |
| Nickel, | Tin, | Gold, | Iron, |
| Platina, | Lead, | Zinc, | Arsenic, |
| Palladium, | Rhodium, | | Antimony. |

### Analogy between the Phenomena of Galvanism and those of Fermentation.

617. M. Schweigger has observed this analogy in the following points:—

618. (1.) Galvanic piles, like fermentable mixtures, exhibit their effects only by the reciprocal action of three different bodies.

619. (2.) The products of galvanic action are two, an oxidated body, and a hydrogenated body. The same happens with the products of fermentation, which are alcohol and carbonic acid.

620. (3.) The presence of electro-negative bodies favors the decomposition of water, whilst, according to Dobino, a similar effect goes on in fermentation.

### Experiments on the Ignition of Wire.

621. The following experiments on the ignition of wires are very interesting. Being connected with the phenomena of caloric developed in the action of the galvanic battery, they may be acceptable as a contribution towards that mass of facts which will at some future period assume a more scientific form.

622. In these experiments, Mr. Murray used four porcelain troughs, each containing ten cells, and each cell supplied with one and a half fluid ounce of the strongest nitrous acid, being filled up with water to the depth of two-thirds, and properly mixed with a glass rod. Nitrous acid, in this proportion, he has ever found best calculated for the development of galvanic action. Fifteen to eighteen inches of fine platinum wire may be readily ignited. He of course used the triad (four inches square), for which we are indebted to the sagacity of that ingenious and profound philosopher, Dr Wollaston.

623. When sulphuric acid is employed, as is done most injudiciously by some, in mixture with the nitrous acid, the vapor is perfectly intolerable, and much of the action is no doubt lost and expended in vapor, and in the great temperature developed at the same time.

624. In connexion with the subsequent detail, it may be proper to mention, that a riband of a platinum foil, was suspended from one of the conductors, and brought in contact with the mercurial surface (that metal being contained in a shallow glass-basin), while the other one is plunged into the mercury, deflagrates with great brilliancy, and oscillates like a pendulum.

625. We may now state generally, that steel and platinum wires may be intensely ignited, in alcohol. ether, and its vapor, oil of olives, naphtha, and sulphuret of carbon. Mr. Murray has not succeeded in igniting these in water, and concludes that it is owing to the superior conducting property of that fluid. The degree of ignition, all circumstances being the same, will correspond with the relations in which the medium containing the wire stands to conduction.

626. Platinum and steel wires may be ignited in carbonic acid gas, hydrogene, cyanogene, and olefiant gas.

627. Gold wire was wrapped round platinum in all its extent; and this double wire placed as the uniting wire between the conducting rods It was ignited throughout, and the fusion of the gold wire supervened, the gold being collected into little spheres of a prolate form, at equal distances, and appearing like a row of beads.

628. Steel wire was, in like manner, entwined with gold wire. It also was ignited in its whole extent; the gold wire was fused, and exhibited the bead-like form.

629. Platinum was woven with copper wire. The platinum wire was ignited throughout; the copper wire not undergoing fusion nor even ignition.

630. It may here be remarked, that, in the ignition and combustion of steel wire, for instance, the fusion is primarily confined to the surface, and the fused scale or film may, perhaps, not penetrate more than one-third the diameter of the wire, while the remaining part may not have undergone the least physical change. The fused matter formed itself into spherules, with regular intervals. This appears to be a curious phenomenon; and it will also be observed that, when the calorific heat is short of ignition, the steel wire will be blued in patches.

631. Steel wire was doubled for one-half its extent; the single and denuded part was alone ignited.

632. Platinum wire was doubled for one-half its extent; and that part only which was single could be ignited.

633. Steel wire was partly enveloped in gold wire; only that portion of the steel wire which was void of the gold wire could be ignited; the part encased in the folds of the gold wire was partially blued, and was rendered magnetic.

634. Copper wire was twisted round platinum wire, for half the length of the latter. The uncovered platinum was alone ignited. Copper wire was twisted around steel wire in the manner of the preceding; the naked steel wire was ignited alone. Steel wire was twisted round platinum wire, for one-half its length; only that portion of the platinum wire excepted from the steel could be ignited.

635. Peculiar phenomena are connected with these exhibitions. When the second wire is carried through the whole extent of the uniting wire, ignition is superinduced throughout; but when only partial, the ignition is confined to the denuded portion.

636. Copper, platinum, and copper wires, were linked together, and made the communicating chain. The platinum placed between the copper wires was ignited alone.

637. Platinum, copper, and platinum wires, exhibited, on the tract of either platinum wire, ignition, while the intermediate copper wire remained dark and unignited.

638. In the case of steel, copper, and steel wires (so linked together), the steel wire on each side was ignited, while the copper wire remained unaltered.

639. In the chain of platinum, steel, and platinum wires, the platinum wires were exclusively ignited, and the steel unignited.

640. In that of steel, platinum, and steel, the intermediate link of platinum was ignited, and the steel wire on each end remained without ignition.

641. In a chain of gold, steel, and gold, the gold wires on each end were ignited and fused, and the intermediate steel was not ignited.

642. In one formed of steel, gold, and steel wires, the central one of gold was exclusively ignited.

643. Mr. Murray next tried spiral coils of platinum and steel, of various diameters, and found that they were ignited, though curvilinear, in the same manner as if the wires were not curved.

644. The preceding experiments seem to prove, that the caloric developed in galvanic action, has no relation with the medium in which the ignition takes place; and that it is evolved in some inverse ratio of the conducting properties of the uniting wire.

645. The phenomena of ignition in links of various metals united into a chain, seem connected with the passage of a material agent through them, displaying its powers in greater or less ignition, according as the passage is interrupted, or its fire more or less retarded, and, of course, as the amount of the resistance. The agent or agents, therefore, developed in transitu from pole to pole, will swell into ignition, if the conducting power of the medium traversed is low, or even burst its metalline confine, and expend its impetus in all the brilliancy of an intense combustion. The gold, platinum, and copper wires, were $\frac{1}{100}$th of an inch in diameter; and the steel the finest harpsichord wire.

### Description and Use of a very Sensible Electrometer, for indicating the Kind of Electricity which is applied to it.

646. Some years back, M. Behrens published the Description of an Electrometer, which indicates the kind of electricity that is presented to it; but it appears to have been forgotten, with the dry electrical columns, which formed an essential part of the apparatus. The electrical perpetual motion of Zamboni is similar to this electrometer, and M. Butzengeiger was employed to execute one of them, which we may proceed to describe.

647. A cylindrical vessel of glass about two inches and a half in diameter, and three and a half high, has fitted to it a brass cap, from which two small dry electrical columns descend into the vessel, and are attached to the cap by screws, so that the one has its positive and the other its negative pole, making a slight projection above the cap. Each column is composed of 400 discs of gold and silver paper, glued together, and three lines in diameter, so as to fill two tubes of varnished glass. Each of these tubes is terminated below by a ring of brass, projecting a little, and rounded, which is in electrical communication with the discs. When the brass cap is in its place, the columns descend vertically, and the lower ring is one-fourth of an inch distant from the bottom of the glass. The axes of the columns are one inch and seven lines distant, but may be brought nearer one another. From the centre of the cap rises a tube of glass, varnished within and without, and within the tube is a brass wire kept in the axis by a cork, but touching the tube no where else. At the lower end of the brass wire is suspended a piece of gold leaf, two inches and a half long and three lines wide, exactly in the middle of the interval between the two columns, and parallel to their axis, if they are accurately vertical. At the upper end of the brass wire is a small brass ball, upon which may be screwed one of the discs of a condenser, as in the electrometer of Volta. By this arrangement, the electrical columns which Behrens had placed without the glass, which defends the gold leaf from the agitations of the air, are placed within the glass, so that their position is not only better preserved, but they are defended so completely from moisture, dust, &c., that they retain the same electrical intensity.

648. This electrometer is used in the following manner:—The cap of metal is put in communication with the ground by means of a metallic wire, and by touching the brass ball, any accidental electricity is discharged, which may belong to this part of the apparatus. If the skin is dry, the touch of the finger is not sufficient. As the gold leaf is suspended between the columns, at the level of the rings of metal which terminate them, the one positively and the other negatively, the gold leaf is attracted equally on both sides, and remains quietly in the middle in its ordinary state; but if, by means of the metallic wire, we communicate to it the weakest degree of electricity, the lower extremity of the gold leaf is attracted by the ring which possesses an electricity opposite to that which is communicated. Having come in contact with this ring, it is successively repelled and attracted by the opposite ring. This oscillatory motion continues till the gold leaf attaches itself to one of the columns, from which it may be easily detached by touching the brass wire, so as to dissipate its electricity, and by shaking the instrument. In order to determine the nature of the electricity, the upper poles of the two columns which project above the brass cap have the signs + and — upon them, and the electricity required is that which is indicated by the sign of the column towards which the gold leaf first moves, or which it first touches, when the electricity is stronger.

649. By this electrometer, strong and weak degrees of electricity may be equally well examined. In the first case, the electrified body is made to approach slowly and at a distance the ball of the electrometer, till the gold leaf is put in motion towards one of the columns. If, for example, we bring an excited stick of sealing-wax to the distance of about three feet from the ball, we shall observe a motion of the gold leaf towards the column marked —. If we bring it to a less distance, it will strike the column, from which it may be easily detached,

by bringing the wax still nearer. In the second case, the electrified body must be moved much nearer the ball, and brought into contact with it, if necessary, till the gold leaf is put in action. This degree of electricity is so weak, that it would be absolutely insensible in the ordinary electrometer of Bennet.

650. When the electricity is still feebler, we may advantageously employ a condenser adapted to the instrument. The circular plate, on the margin of which is screwed the ball of the electrometer, replaces the cover of the condenser, and a plate of disc furnished with a glass handle, and which is placed above the first, represents the base. These plates are covered with a thin coating of amber varnish on the faces which are brought into contact. If we wish to try a very weak electricity, we first touch, in order to deprive it of its electricity, the inferior plate, or the wire which carries the ball; we then place above it the other plate, and afterwards touch the lower plate or its wire, with the body whose electricity we wish to examine, touching, at the same time, the upper plate, in order to deprive it of its electricity. The upper disc is then removed by its glass handle, and we observe towards which of the two small columns the gold leaf is carried, and the sign marked upon this column will indicate the kind of electricity. If, for example, we put in contact with the lower surface of the lower plate of the condenser a small disc of zinc, about three-fourths of an inch in diameter, and press it against this plate, without touching the plate with the finger, and if we touch at the same time the upper disc of the condenser, to deprive it of its electricity, and if we afterwards remove the disc of zinc on one side, and on the other side the upper plate, we shall observe the gold leaf approach the column marked *minus*. A similar effect will be observed, if we put in contact with the disc of the apparatus the metallic side of a piece of silvered paper.

651. It will often be more convenient to put the body we wish to examine in contact with the upper and moveable plate, and touching the inferior plate, to deprive it of its electricity, proceding in other respects as we have already described. The electricity, however, which the instrument now indicates, will be opposite to that which is communicated to the upper plate, because, by this method, the plate united to the instrument forms the base of the condenser.

652. If the body which we examine cannot be conveniently put in immediate contact with the lower plate of the condenser, a communication with it may be formed, by means of a metallic wire, with an insulating handle, the rest of the operation being the same as before.

## Electro-magnetic Effects of Alkalies, Acids, and Salts, by M. Yelin.

653. The magnetic needle used by M. Yelin was nearly 1·5 inch long, and ·008 of an inch in diameter. It weighed little more than half a grain, and was delicately suspended by a spider's web, from a rod passing through the top of a glass cylinder, so that it could be raised or lowered at pleasure. The bottom of the instrument is a piece of card-board, on which circles are marked and divided, indicating the number of degrees through which the needle may have moved.

654. The conductor, whose state was to be indicated by this needle, was sometimes a band of tin 0·4 of an inch broad, and 24 inches long; sometimes a brass-wire helix, which, being brought up close beneath the needle, formed a kind of condenser, and rendered the action more sensible.

655. (1.) The tin band was placed under the needle, both being parallel to the magnetic meridian; a small glass was filled with muriatic acid; the end of the band, towards the austral pole of the needle, was plunged into the acid, and, in a few moments after, the other extremity was immersed; immediately the austral pole went to the east. The experiment being repeated, except that the end of the band, corresponding to the boreal of the needle, was first immersed; the austral pole went to the west. When, in place of muriatic acid, a solution of ammonia, mineral alkali (soda), or sal-ammonia, was used, the results were exactly the same; but if a solution of vegetable alkali (potassa) was used, the deviations were all in the opposite directions. Pure water produced no effect, but $\frac{1}{500}$ of acid made it active. All solutions of salts, or acid, thus applied, produced an effect upon the needle. It appears in these cases that, according as the first contact is made to the right or left, an arrangement of molecules is established in the fluid, proper to form a species of pile of which the two poles are very distinct, and that the whole of this little pile is reconstructed in the opposite direction, when the contact is made in the opposite way.

656. Place the needle over the condenser, the wires of the latter and the needle being parallel to the magnetic meridian; hold a cylinder of zinc in perfect contact with each end of the wire of the condenser, the arrangement will then be zinc, brass, zinc; plunge the cylinder corresponding with the austral pole of the needle into muriatic acid, and then plunge the other into the same acid, the austral pole of the needle will go towards the east. Repeat the experiment with nitric acid and fresh cylinders of zinc; now the austral pole of the needle will go towards the west. These and other results are the same, whether the conductors are put in contact with the metals before or after their immersion in the fluid.

657. The needle condenser and metal bars (zinc), being as before, let the glass be filled with a solution of potassa, then immerse the end of the bar corresponding to the austral pole of the needle, and afterwards the other bar; the austral pole will deviate to the east. Take the bars out of the solution, but without changing their position in the hands, and, as soon as the needle is at rest, introduce them again beginning with the bar corresponding to the boreal pole of the needle; the needle (the austral pole) will now deviate to the west. Take the bars out of the fluid, and, without changing them from hand to hand, turn them so that the ends which were before immersed in the liquid, shall now be in contact

with the extremities of the condenser wire, then repeat the above experiments, and the same results will be obtained. Finally, if the bars, being well cleaned, are changed from hand to hand, and the experiments again repeated, the same results will be produced.

658. But now, preserving the apparatus as it was, change the solution of potassa for very pure muriatic acid. The zinc bar, corresponding to the boreal pole, being first immersed in the acid, the austral pole will go eastward. Remove that bar from the acid which was last plunged in, and a little while after, the other bar, and without changing them at all in the hand, wait till the needle is quiet; commence by the bar corresponding to the boreal pole; at the moment when that which agrees with the austral pole shall touch the acid, the needle (the austral pole) will deviate towards the west, and it will go in the same direction as often as the experiment is repeated, whether the operation be begun on the right or on the left hand.

659. If the bars be then well washed and dried, and restored to the ends of the condenser wire they were in contact with before, but with that part which was before immersed, now in contact with the wire, and the immersions and experiment be repeated, one of these two things will happen: either the needle will constantly move to the east, whichever bar is first immersed, or the action will be very doubtful or null.

660. If, instead of turning the bars, they are changed one for the other, the needle will go constantly to the west, whichever bar is first immersed; but the previous results may be at any time restored by re-changing the bars, and then the needle will go to the east.

661. The faculty thus acquired by the bars of zinc, of becoming positive or negative, according as they are plunged either first or last in the acid, they preserve some time. They may be washed, dried, and held in the hand, without losing their state, and hence particular precautions are required in making delicate experiments with the metals.

662. This faculty is not communicated either to the fluid or to the extremities of the condenser wire. All the metals which become magnetometers by muriatic acid, as well as all the acids which produce an electro-magnetic action with homogeneous metals, produce the same phenomena.

663. These experiments may be compared, with interest, with the observations of M. Volta, that a band of wet paper, making part of the conductor of his pile, becomes charged with electricities, which it preserves some time; with that of M. Gautheret, who thought he remarked something similar in the conducting wires of the pile; and with that of M. Ritter on his secondary piles, the phenomena of which M. Volta attributed to the electro-motive action of the alkalies and salts interposed. 'A very decided electric charge may be remarked in the metals interposed between the conductor and the fluid; they are both unipolar, i. e. charged each with a single electricity, which they retain for some time, and this electricity is constantly positive in one, and negative in the other. They form, therefore, the elements of a species of pile, of which the extremities may be detached without losing their electricity; and, in consequence of this property, I call it a secondary pile, with mobile unipolar extremities.

664. 'I have sometimes succeeded, with bars of some length, in obtaining distinct poles at each extremity, so that when the bars were turned, opposite results were presented by the needle; but I have not been able to discover the condition of this phenomenon, so as to be able to produce it at pleasure.'

665. M. Yelin remarks, however, that he has never yet been able to ascertain the existence of free magnetism, or electricity, in any of these bars. Many other experiments are given in tables, which we have not room to notice, though they are of great interest. The bars M. Yelin used were ·275 of an inch in diameter, and 2·75 inches long.—*Bib. Univ.* xxiii. 38.

### Terrestrial Magnetism.

666. The following curious electro-magnetic experiment was exhibited by Dr. Birkbeck, at the London Institution. A hollow globe of wood, fifteen inches in diameter, was first accurately turned, and, from the equator towards each extremity of its axis, grooves were cut parallel to the equator, at the distance of 4½° from each other, like parallels of latitude, and another, rather deeper, groove from one pole to the other, along a meridian half-round.

667. Beginning now at the equator with the middle of a wire, about ninety feet in length, and one-tenth of an inch in diameter, which just fitted the grooves, it was carried round in the successive circles towards each pole, making an abrupt turn from one circle to another along the meridian groove above-mentioned. From the point where the wire arrived at the poles, it was carefully bound with silk, and returned back again to the equator along the same meridian. The two ends of the wire being thus brought together, they proceeded to a little distance from the globe, where they terminated. By this means the effect of the short abrupt turnings of the wire along the meridian towards the poles, is counteracted by wire returning back again from the poles to the equator, leaving thereby only the parallel wires active when the two extremities are connected with the battery.

668. The globe being thus far formed, it is covered with zones, in the usual way, so as to exhibit to appearance a common fifteen-inch terrestrial globe, the wire being completely hidden. But this covering is so laid on that, instead of the terrestrial pole coinciding with the poles formed by the wire, the latter is brought into lat. 75° N., and long. 76° 40′ W., which is the situation which Mr. Barlow conceives will best agree with the observed bearings of the needle in most parts of the world. Things being thus adjusted, the globe is placed on a large cup near the battery, so as to admit of its being placed in any position, or so as to bring any part to the zenith, without the encumbrance of the usual brazen meridian and horizon. A needle is now suspended over the globe, leaving it free to take any dip; while, by means of a silk suspension, it is

also free to take any direction; lastly, the needle is insulated from the action of terrestrial magnetism, by opposing to it the north end of a small bar magnet in the line of the dip. By this means the needle retains its magnetic power, but is under no magnetic influence.

669. The extremities of the curves being now connected with the poles of the battery, the globe immediately becomes strongly active upon the needle, causing it to assume the same dip, and the same direction, with respect to the artificial globe, as the actual needle does in the corresponding part of the earth itself, at least to a very considerable extent. Thus, if we bring the Island of Ascension to the zenith, the needle is found perfectly horizontal, with a slight westerly variation. If we bring London to the zenith, we find the dip about 70°, and 24° or 25° of westerly variation; if the globe is again shifted in position, so as to bring Cape Horn in the zenith, the dip is about 60° the contrary way, that is, with the south end below; and the variation about 30° easterly, and so on with various other places.

670. The purpose of this experiment is to show, that what we have hitherto considered as the magnetism of the earth, may be only modified electricity, and to illustrate, experimentally, the theory advanced by M. Ampère, who attributes all magnetic phenomena to electrical results.

### Rousseau's Apparatus.

671. M. Rousseau, who has been occupied several years in the construction of dry Voltaic piles, has conceived the idea of employing those instruments to appreciate the different degrees of conducting power of the substances arranged in the class of bad conductors of electricity. For this purpose he has contrived the apparatus we are about to describe. The dry pile, which forms the principal part of it, is made of discs of zinc and tin-foil, separated by pieces of parchment, soaked in a mixture of equal parts of oil of poppies and essence of turpentine; the whole is covered laterally with resin, to prevent the contact of the air. The base of the pile communicates with the ground. Its upper extremity may be connected by a metallic wire with an insulated vertical pivot, carrying a weakly magnetic needle, balanced horizontally. On a level with the needle, and distant from the pivot, about half the length of the latter, is a metallic ball, also insulated, but communicating with the pile. It is evident that, by this arrangement, the electricity accumulated at the upper pole of the pile is communicated to the needle and the ball; and consequently repulsion ensues, tending to separate the needle, which is moveable, from the ball which is stationary. If we place the pivot and the ball in the magnetic meridian, the needle touches it, and remains at rest as long as the apparatus is not connected with the pile; but the instant the communication is established between them, the needle is repelled; and, after some oscillations, takes its position of equilibrium, depending on its magnetic power and the energy of the pile. These two quantities remain constant for a considerable time, with the same apparatus, as may be ascertained by determining the angle which the needle makes with the magnetic meridian, after it has assumed a fixed position, by means of a divided circle adapted to the cage which covers it. A simple conducting needle, suspended by a metallic wire of proper diameter and length, might be substituted for the magnetic one; but M. Rousseau's apparatus is much more convenient, and sufficiently sensible for the kind of effect which it is his object to measure.

672. To use it for ascertaining different degrees of conducting power, it is sufficient to place the substance submitted to experiment in the electrical current, taking care that the thickness which the electricity has to pass through be always equal. If the flow of the quantity of electricity necessary to produce the greatest deviation be not instantaneous, the time required by the needle to assume its fixed position may be taken as the measure of the degree of the conducting power of the substance employed.

673. To submit liquids to this kind of examination, M. Rousseau places them in small metallic cups, communicating by their foot with the needle and the ball: he then places in the liquid one of the extremities of the metallic wire, covered with gum lac, that the same surface of metal may always be in contact with the fluid, and measures the duration of the needle's motion from the moment when the communication is established with the pile by the other extremity of the wire.

674. By submitting the fixed vegetable oils employed in the arts and in domestic economy to this kind of proof, M. Rousseau has established a very singular fact, which may be useful in commerce; it is, that olive oil possesses a very inferior degree of conducting power to that of all other vegetable or animal oils, which nevertheless present, in all their physical properties, the strongest analogies to that substance. For instance, every thing being equal in both cases, olive oil required forty minutes to produce a certain deviation, while poppy oil, or the oil of the beech-mast, required only twenty-seven seconds to produce the same deviation. One-hundredth part of any other oil added to oil of olives reduces the time to ten minutes. It would, therefore, be easy to discover, by means of this instrument, the smallest traces of any oil fraudulently mixed with oil of olives.

675. If the proportion of the foreign substance be considerable, the difference of time necessary to produce the maximum of effect would no longer be sufficiently great, and could not be measured with sufficient precision to indicate the proportion of the elements, but the apparatus might easily be modified so as to adapt it to this kind of determination.

676. The solid fats are worse conductors than the animal oils, arising, no doubt, from the large proportion of stearine contained in the former; for M. Rousseau is satisfied, by comparative trials with stearine and elaine, prepared by M. Chevreul, that the conducting power of the latter much exceeds that of the former. The fat of an animal becomes a worse conductor in proportion to the age of the individual which affords it.

677. By means of the same apparatus, we

may also observe a considerable difference between resin, gum-lac, and sulphur, the most insulating of all known substances, and silk, crystal, and common glass.

678. M. Rousseau has not found any difference in the conducting power of liquids, whether spirituous or aqueous, acid, alkaline, or neuter, the time required by the needle to arrive at the maximum of deviation being too short, in every case, to ascertain the inequality of its duration. But a modification of the apparatus, similar to that for determining the proportions in an oleaginous mixture, would easily point out that difference.

679. It would be equally possible, and very curious, to try the effect of the two kinds of electricity on different substances; all that would be necessary would be to place the two poles alternately in connexion with the ground. According to Ermann's results, it is probable that a difference would be found between most substances.

# INDEX.

ELECTRUM, Gr. ηλεκτρον. Amber: or a mixed metal, according to some authors. See ELECTRE, ELECTRICITY, and below.

*She of whose soul, if we may say 'twas gold,*
*Her body was the electrum and did hold*
*Many degrees of that.* — *Donne.*

ELECTRUM, Lat. Ἤλεκτρον, Gr. Electrum, according to Ovid, was that resinous substance now called amber; of which there are two kinds, the white and the yellow. Sometimes its color approaches to a hyacinthine red. Also, according to Pliny (lib. xxx. cap. 4), a mixture of gold and silver, of which the fifth part was silver. According to other ancient writers, they had three varieties of substances called electrum, that were used in the arts; namely, glass, a compound metal, and succinum. In the Homeric poems electrum is often mentioned, which seems to have been succinum, the yellow or white amber. According to Eustathius the ancients used sometimes to call gold by this name, probably from its brilliancy, the word ἠλέκτωρ signifying the sun. Pliny thinks that the alloy is the same that Homer mentions in the fourth book of the Odyssey, in describing the palace of Menelaus, which he says was ornamented with gold, electrum (ἤλεκτρον), silver, and ivory. The scholiast upon Aristophanes, supposes that the electrum of Homer was glass, but there is nothing in any of his works to warrant such a supposition, for glass is not designated by any character. It is more probable that electrum was yellow amber, which has a resplendent sunny brilliancy according with its Greek name; and Herodotus mentions that succinum or amber was known to the ancients. Pliny says, all gold is naturally alloyed by silver in various proportions; some containing a tenth, some a ninth, and some an eighth part. Wherever the silver amounts to a fifth of the mass, the compound is called electrum; this alloy may also be prepared artificially, by adding to gold the requisite proportion of silver. But if this latter exceeds a fifth of the whole, the mass ceases to be malleable. The nature of electrum is to reflect a richer lustre by lamp-light than pure silver does. That which is native has also the additional property of detecting poisons, iridescent rings passing rapidly over the surface of the cup, accompanied by a noise like that of hot metal plunged in water.

Electrum was not only used for ornamental plate, but was occasionally employed for coin, at least for medals. Thus Lampridius, in his life of Alexander Severus, says that that prince caused medals to be struck in honor of Alexander the Great, both of electrum and gold. (Electreos aliquantos, sed plurimos tamen aureos.) The Romans themselves appear to have preferred the white lustre of silver to the yellow radiance of gold, &c. probably this taste together with the imperfection of the art of assaying, as practised by them, aided also by an idle superstitious notion of the efficacy of electrum in detecting poison, contributed to give to this alloy a temporary celebrity. Modern taste, however, prefers the native lustre of the noble metals in all their purity to any alloy of them with each other, nor is it probable, that the Roman electrum will ever again be met with at the mint or on the sideboard. There are many coins of this alloy of the kings of Bosphorus, some small ones of Syracuse, and many Celtic and of ancient Gaul.

ELEC'TUARY, *n. s.* Fr. and Belg. *electuaire;* Ital. *elettuario;* Span. and Port. *letuario;* Lat. *electuarium;* all from Gr. εκλεκτηριον, εκλεγω, eligo, to choose—Minsheu. But Vossius and Gesner prefer εκλειγμα, from εκλειχειν, to lick; as the etymology. A form of medicine made of conserves and powders, in the consistence of honey. The modern pharmacopœias treat of these articles as confections.

We meet with divers *electuaries,* which have no ingredient, except sugar, common to any two of them. — *Boyle.*

*Electuaries* made up with honey or syrup, when the consistence is too thin, ferment: and when too thick, candy. By both which the ingredients will be altered or impaired. — *Quincy.*

ELEEMOSYNA ARATRI, ELEEMOSYNA CARUCARUM, or pro aratris, in our ancient customs, a penny which king Ethelred ordered to be paid for every plough in England towards the support of the poor. It is sometimes also called eleemosyna regis, because first appointed by the king.

ELEEMOSYNARIUS, in old records, the almoner, or officer who received the eleemosynary rents and gifts, and distributed them to charitable uses. See ALMONER.

ELEEMOS'YNARY, *n. s.* & *adj.* Gr. ελεημοσυνη; ab ελεος, compassion. One who lives upon alms: as an adjective it means given in charity or living upon it.

It is little better than an absurdity, that the cause should be an *eleemosynary* for its subsistence to its effects, as a nature posterior to and dependent on itself. — *Glanville's Scepsis.*

In the year 1430, it appears that the *eleemosynary* boys, or choristers, of that monastery acted a play. — *Warton. History of English Poetry.*

EL'EGANCE, *n. s.* }
EL'EGANCY, }
EL'EGANT, *adj.* }
EL'EGANTLY, *adv.* }
Fr. *elegance;* Ital. *eleganza;* Lat. *elegantia, elegans, ab eligere,* to choose. The beauty of propriety, not of greatness, says Dr. Johnson. Rather that which is selected or chosen because it pleases: hence applied particularly to objects of taste. Milton uses the adjective for accurate in discernment, or nice in taste.

St. Augustine, out of a kind of *elegancy* in writing, makes some difference. — *Raleigh's History.*

They describe her in part finely and *elegantly,* and in part gravely and sententiously. — *Bacon.*

Lovers are anxious to trick themselves out; to be spruce in their apparel; to have their locks neatly combed and curiously curled; to adorn their shoes with *elegant* ties; to be point device in all their accoutrements. — *Burton.*

Now read with them those organic arts which enable men to discourse and write perspicuously, *elegantly,* and according to the fittest style of lofty, mean, or lowly. — *Milton.*

*In a poem elegantly writ,*
*I will not quarrel with a slight mistake.*
— *Roscommon.*

These questions have more propriety, and *elegancy*, understood of the old world. *Burnet.*

My compositions in gardening are altogether Pindarick, and run into the beautiful wildness of nature, without the nicer *elegancies* of art. *Spectator.*

Polite with candour, *elegant* with ease. *Pope.*

Whoever would write *elegantly*, must have regard to the different turn and juncture of every period: there must be proper distances and pauses.
*Pope's Odyssey, Notes.*

There may'st thou find some *elegant* retreat.
*London.*

The *elegant* arts owe their choicest beauties to a taste for the contemplation of nature. *Percival.*

If we can direct the lights we derive from such exalted speculations upon the humbler field of the imagination, whilst we investigate the springs, and trace the courses of our passions, we may not only communicate to the taste a sort of philosophical solidity, but we may reflect back on the severer sciences some of the graces and *elegances* of taste, without which the greatest proficiency in those sciences will always have the appearance of something illiberal.
*Burke.*

This cap to my cousin I owe;
She gave it, and gave me beside,
Wreathed into an *elegant* bow,
The riband with which it is tied. *Cowper.*
And that vice,
Though well perfumed and *elegantly* dressed,
Like an unburied carcass tricked with flowers,
Is but a garnished nuisance, fitter far
For cleanly riddance, than for fair attire. *Id.*

His infant muse, though artless, was not mute:
Of *elegance* as yet he took no care;
For this of time and culture is the fruit;
And Edwin gained at last this fruit so rare;
As in some future verse I purpose to declare.
*Beattie.*

ELEGIT, in law, a writ of execution, which lies for a person who has recovered debt or damages; or upon a recognizance in any court, against a defendant who is not able to satisfy the same in his goods.

EL'EGY, *n. s.* }
ELE'GIAC, *adj.* }
ELE'GIAST, *n. s.* }
Fr. *elegie;* Ital. Span. and Lat. *elegia*, of Gr. ελεγος, complaint or grief. A plaintive or funeral poem. An elegiast, or elegist, is a writer of such poems.

He hangs odes upon hawthorns, and *elegies* upon brambles, all forsooth deifying the name of Rosalind.
*Shakspeare.*

So on Meander's banks, when death is nigh,
The mournful swan sings her own *elegy*. *Dryden.*
Let *elegiac* lay the woe relate,
Soft as the breath of distant flutes. *Gay's Trivia.*

ELEGY is derived from the Greek ελεγεια; but who was the inventor of elegiac poetry is not known. Horace acknowledges himself ignorant of it. Among the Latins, the principal writers of elegiac verse were Propertius, Ovid, and Tibullus; the latter of whom is esteemed by Quintilian the best elegiac poet; but the former is preferred by the younger Pliny. Among the Greeks, Callimachus, Parthenius, and Euphorion, were the principal writers of elegy. See POETRY.

EL'EMENT, *n. s.* & *v. a.* }
ELEMENT'AL, *adj.* }
ELEMENTAR'ITY, *n. s.* }
ELEMENT'ARY, *adj.* }
Fr. *element;* Span. Port. and Ital. *elemento;* Lat. *elementum.* According to Vossius from old Lat. *eleo*, (*oleo*), *cresco*, to increase; because all things are supposed to proceed from certain elements. A first, or constituent principle: hence an ingredient or constituent part; and that which is proper, or agreeable, to a person or thing. The verb, derived from the noun, is used by our old writers for to compound with elements, to constitute. Sometimes 'the element,' when used alone, signifies the air. Elementarity is simplicity of nature; the state of being uncompounded: elementary, having but a single or simple principle; initial; made of, or belonging to, the elements.

We, when we were children, were in bondage under the *elements* of the world. *Gal.* iv. 3.

The heavens and the earth will pass away, and the *elements* melt with fervent heat. *Peter.*

Every parish should keep a petty schoolmaster, which should bring up children in the first *elements* of letters. *Spenser.*

With religion it fareth as with other sciences; the first delivery of the *elements* thereof must, for like consideration, be framed according to the weak and slender capacity of young beginners. *Hooker.*

If nature should intermit her course, those principal and mother *elements* of the world, whereof all things in this lower world are made, should lose the qualities which now they have. *Id.*

He (a courtier) is not, if he be out of court, but, fish-like, breathes destruction, if out of his own *element*. *Sir T. Overbury.*

The king is but a man: the violet smells to him as it doth to me; and the *element* shews to him as it doth to me. *Shakspeare.*

The king,
Contending with the fretful *elements*,
Bids the wind blow the earth into the sea,
Or swell the curled waters. *Id. King Lear.*

Who set the body and the limbs
Of this great sport together as you guess?
——One sure that promises no *element*
In such a business. *Id. Henry VIII.*

We are simple men; we do not know she works by charms, by spells, and such daubry as is beyond our *element*. *Shakspeare.*

A prince should watch that his reason may not be so subdued by his nature, as not to be so much a man of peace as to be a jest in an army; nor so much a man of war, as to be out of his *element* in his council.
*Saville.*

Here be four of you, able to make a good world for you are as differing as the four *elements*. *Bacon.*

Not all, as if some perished by this,
But so as all in you contracted is:
As of this all, though many parts decay,
The pure, which *elemented* them, shall stay.
*Donne.*

Have not all souls thought,
For many ages, that our body's wrought
Of air, and fire, and other *elements?*
And now they think of new ingredients. *Id.*

Sure it is but an *elementary* fire that goes out; that which is celestial continues.
*Bp. Hall. Contemplations.*

Our torments may, in length of time,
Become our *elements*. *Milton.*

Leeches are by some accounted poison, not properly, that is by temperamental contrariety, occult form, or so much as *elemental* repugnancy; but, inwardly taken they fasten upon the veins, and occasion an effusion of blood. *Browne.*

A very large class of creatures in the earth, far above the condition of *elementarity*.
*Browne's Vulgar Errours.*

He from his flaming ship his children sent,
To perish in a milder *element*. *Waller.*

A man may rationally retain doubts concerning the number of those ingredients of bodies, which some call *elements*, and others principles. *Boyle.*

Whether any one such body be met with, in those said to be *elemented* bodies, I now question. *Id.*

There is nothing more pernicious to a youth, in he *elements* of painting, than an ignorant master.
*Dryden.*

If dusky spots are varied on his brow,
And streaked with red, a troubled colour show;
That sullen mixture shall at once declare
Winds, rain, and storms, and *elemental* war.
*Dryden's Virgil.*

All rain water contains in it a copious sediment of terrestrial matter, and is not a simple *elementary* water. *Ray.*

They shew that they are out of their *element*, and that logick is none of their talent.
*Baker on Learning.*

The *elementary* salts of animals are not the same as they appear by distillation. *Arbuthnot on Aliments.*

Soft yielding minds to water glide away,
And sip with nymphs their *elemental* tea. *Pope.*

Simple substances are either spirits, which have no manner of composition, or the first principles of bodies, usually called *elements*, of which other bodies are compounded. *Watts.*

First the fine forms her dulcet voice requires,
Which [illegible] in *elemental* flow. *Darwin.*

Peace, heaven-[illegible]nded maid, whose powerful voice
From ancient darkness called the morn;
Of jarring *elements* composed the noise,
When Chaos, from his old dominion torn,
With all his bellowing throng,
Far, far was hurled the void abyss along. *Beattie.*

Elements, in astronomy, are those principles deduced from astronomical observations and calculations, and those fundamental numbers which are employed in the construction of tables of the planetary motions. Thus, the elements of the theory of the sun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The elements of the theory of the moon are its mean motion; that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c

Elements, in physics, the first principles of which all bodies in the system of nature are composed These are supposed to be few in number, unchangeable, and by their combinations to produce that extensive variety of objects to be met with in the works of nature. There seems to be in reality some foundation for this doctrine; for there are some principles evidently exempted from every change or decay, but which can be mixed or changed into different forms of matter. A person who surveys the works of nature in an inattentive manner, is apt to form a contrary opinion, when he considers the numerous tribes of fossils, plants, and animals, with the wonderful variety that appears among them in almost every instance. He is thence induced to conclude, that nature employs a vast variety of materials in producing such prodigious diversity. But let him enquire into the origin of this apparent diversity, and he will find that those bodies which seem the most different from each other are at bottom nearly the same. Thus the blood, chyle, milk, urine, &c., as well as the various solid parts of animals, are all composed of one particular substance. The same simplicity appears in the original composition of the nourishment of vegetables, notwithstanding the variety among them with respect to hardness, softness, elasticity, taste, odor, and medical qualities. They chiefly depend, for these, upon water and the light of the sun. Reflections of this kind suggested an idea of several principal elements of which all other bodies are composed, which by their various combinations furnished all the variety of natural bodies. Democritus, Aristotle, and other great philosophers of antiquity, fixed the number to four, which have retained the name of elements ever since. These are, fire, air, earth, and water; each of which they imagined was naturally disposed to hold its own place in the universe. Thus, the earth, as heaviest, naturally tended towards the centre, and occupied the lower parts; the water, as approaching next to it in gravity, was spread chiefly on the outside of the earth; the air, being more subtile and rare, occupied the middle place; while the fire, being still more subtile and active, receded to the greatest distance of all, and was supposed to compose the planets and stars. This system was extended to all the productions of nature. The older chemists, with Paracelsus at their head, pretend to speak of four elementary bodies, salt, sulphur, earth, and mercury: but when we attempt to form an idea of what they mean, we find it very confused; and that their expressions concerning them are enveloped in so much obscurity, that they cannot be comprehended. Some have attempted to prove that the elements, whatever they are, must necessarily be invisible or imperceptible by any of our senses. An enquiry into their number or properties, therefore, must be attended with very little success; and all the knowledge we can have upon the subject must be drawn from a view of their combinations, and reasoning analogically from the transmutations we observe to take place in nature. We find that all the different kinds of air are composed of that invisible and subtile fluid named heat, united in a certain way with some other substance: by which union the compound acquires the properties of gravitation, expansion, rarefaction, &c.; for pure heat, unless when united with some terrestrial substance, neither gravitates nor expands. This is evident from the phenomena of the burning glass, where the light concentrated in the focus will neither heat the air nor water, unless it meets with something with which it can form a permanent union Heat, therefore, is justly to be considered as one of the original elements, being always capable of uniting with bodies, and of being extricated from them unchanged, while the same bodies are by their union with it changed into various forms; water, for instance, into vapor or ice, both of which return into their original state by the abstraction or addition of heat in a certain degree. Hence some have concluded that

there are only two elements in the universe: and this opinion we find adopted by count De Tressan, in his essay on the Electric Fluid. According to this doctrine, two primitive material substances seem to exist in nature; one that incessantly acts, and to which it is essential to be in motion; the other absolutely passive, and whose nature it is to be inert, and move entirely as directed by the former. According to the doctrines which long prevailed among chemists, there are three things that seem to be unchangeable, viz. earth; carbon, or charcoal; and that invisible, though terrestrial and gravitating principle, the basis of chlorine. In our experiments (say the French chemists) on earth, we find that, though vitrified by the most intense fire, it may be recovered in its proper form; and some very pure earths cannot be changed even in the focus of the most powerful mirror. In like manner we may dissipate charcoal in vacuo by the solar rays, and the compound is hydrogenous gas; we may decompose this compound by a metallic calx, and we have our charcoal again unchanged, for all metals contain charcoal in substance. Let us try to destroy it by common fire, and we have it then in the fixed air produced, from which it may be recovered unchanged by the electric spark. With the supposed basis of chlorine, the case is still more difficult, for we cannot by any means procure a sight of it by itself. Modern chemistry reckons fifty-two elements, but as these are only bodies, which the present state of instruments, &c., prevent us from decomposing, their number is continually changing, and we therefore refer the reader to our articles CHEMISTRY, MINERALOGY, &c.

ELEMI, *n. s.*

This drug is improperly called gum *elemi*, being a resin. The genuine *elemi* is brought from Ethiopia in flattish masses, or in cylinders, of a yellowish colour. It is very rare in Europe, and supposed to be produced by a tree of the olive kind. The spurious, or American *elemi*, almost the only kind known, is of a whitish colour, with a greater or less greenish or yellowish tinge. It proceeds from a tall tree, which the Brasilians wound, and collect the resin.
*Hill's Mat. Med.*

ELEMI, a resin, which exudes from incisions made, in dry weather, through the bark of the amyris elemifera, a tree which grows in America. It is wrapped in flag leaves, in long roundish cakes, semitransparent, and of a yellow color. It has a faint fragrance.

ELEMI, in the materia medica. See AMYRIS.

ELENCH, *n. s.* } Old Fr. *elenche*; Lat.
ELENCHIZE, *v. n.* } *elenchus*; Greek, ελεγχος, an argument or sophism. To elenchise used only (as far as we have found), by Ben Jonson, is to argue; construct sophisms.

TIP. Hear him problematize.
PRU. Bless us, what's that!
TIP. Or syllogize, *elenchize*. *Ben Jonson.*

The first delusion Satan put upon Eve, and his whole tentation might be the same *elench* continued, as when he said, Ye shall not die; that was, in his equivocation, you shall not incur present death.
*Browne's Vulgar Errours.*

Discover the fallacies of our common adversary, that old sophister, who puts the most abusive *elenches* on us. *Decay of Piety.*

ELENCHUS, in antiquity a kind of ear rings set with large pearls.

ELENCHUS, in logic, by the Latins called argumentum and inquisitio, is a vicious or fallacious argument, which deceives under the appearance of a truth; the same with what is otherwise called sophism.

ELE'OTS, *n. s.* Some name the apples in request in the cyder countries so; not known by that name in several parts of England.
*Mortimer's Husbandry.*

EL'EPHANT, *n. s.* } Fr. *elephante*, Span.
ELEPHAN'TINE, *adj.* } and Port. *elefante*; Lat. *elephas*; Gr. ελεφας, as Hyde suggests, from Arab. *phil*, a mountain; and Vossius has a similar conjecture. A genus of the mammalia class of animals, more particularly described in the ensuing article.

The *elephant* hath joints, but not for courtesy;
His legs are for necessity, not flexure. *Shakspeare*

High o'er the gate, in *elephant* and gold,
The crowd shall Cæsar's Indian war behold.
*Dryden's Virgil.*

The fan shall flutter in all female hands,
And various fashions learn from various lands;
For this shall *elephants* their ivory shed,
And polished sticks the waving engines spread.
*Gay*

Dear architect of fine chateaux in air,
Worthier to stand for ever if they could,
Than any built of [illegible] wood.
For back of [illegible]

ELEPHANT, in zoology. See ELEPHAS.

ELEPHANT, AMERICAN. See MAMMUTH.

ELEPHANT BEETLE. See SCARABÆUS.

ELEPHANT HOG. See TAPIR.

ELEPHANT, KNIGHTS OF THE, an order of knighthood in Denmark, conferred upon none but persons of the first quality and merit. It is also called the order of St. Mary. Its institution is said to have been owing to a gentleman among the Danish croises having killed an elephant in an expedition against the Saracens in 1184; in memory of which, king Canute instituted this order; the badge of which is a towered elephant, hung on a watered sky-colored riband, like the George in England.

ELEPHANTA, a small but very remarkable island on the west coast of Hindostan, five miles and a half from Bombay, in an easterly direction; its circumference cannot be more than five miles; a neat village near the landing place contains all its inhabitants, who, inclusive of women and children, number about 100. To deduce the era of the fabrication of its celebrated cave or temple is not so easy a task; but it was, no doubt, posterior to the great schism in the Hindu religion, which, according to the Puranas, happened at a period coeval with our date of the birth of Christ. It is under the protection of the India Company, and pays about £56 annually to the government; the surplus revenue furnishes their simple clothing. An elephant of black stone, large as the life, is seen near the landing place, from which the island probably took its name. The cave formed in a hill of stone, is about three-quarters of a mile from the beach; its massy roof is supported by rows of columns regularly disposed, but of an order dif-

ferent from any in use with us; gigantic figures in relief are observed on the walls; these, as well as the columns, are shaped in the solid rock, and by artists, it would appear, possessed of some ability, and unquestionably of astonishing perseverance. They are very massive, short in proportion to their thickness, and their capital bears some resemblance to a round cushion pressed by the superincumbent mountain, with which they are also of one piece. The floor of the apartment is generally full of water, its pavement or ground-work not permitting it to be drawn off, or to be soaked up. For it is to be observed, that even the cavern itself is not visitable after the rains, until the ground of it has had time to dry into a competent hardness. Several of the columns have been levelled, and the figures mutilated, as Mr. Goldingham was informed by the Portuguese, who were at the trouble (and no small one) of dragging cannon up the hill for the better execution of this exploit. The cave at Elephanta is not now in use as a temple, nor is it a place of pilgrimage, or possessed of a sacerdotal establishment; although neighbouring individuals make occasional offerings of prayers and oblations. Considering the pains bestowed on it, it must, at some period of time, have been held in greater estimation; but the brahmins in general disregard imperfect or mutilated images.

Various have been, and are to this day, the conjectures respecting the Elephanta Cave. Those who attempt to deduce its origin from the Egyptians, from the Jews, or from Alexander the Great, appear to give themselves much unnecessary trouble. The striking resemblance in several particulars of the figures in the cave to the present Hindoo race, would induce those who, from history as well as from observation, have reason to believe they have preserved the same customs from time immemorial, to imagine that the ancestors of these people were its fabricators; but those who are in a small degree acquainted with their mythology, will be persuaded of it; nor is a much greater extent of knowledge requisite to enable us to discover it to be a temple dedicated principally to Siva, the destroyer or changer.

ELEPHANTINA, called also Ghezirat-el-Sag, or the 'flowery island,' an island of the Nile, in Upper Egypt, described by captain Light as a perfect paradise. 'It must be confessed that we find beauty by comparison; and this must excuse all travellers in their particular praise of spots, which elsewhere would not, perhaps, call forth their eulogy. Though the season of the year was approaching to the greatest heat, shade was every where to be found amongst the thick plantations of palm trees, which surrounded and traversed the island. Amongst these the modern habitations showed themselves, whilst the eye often rested on the ancient temples still existing. Every spot was cultivated, and every person employed; none asked for money; and I walked about, greeted by all I met with courteous and friendly salams. The intercourse I had with the natives of Assuan was of a very different nature; and in spite of French civilisation and French progeny, which the countenances and complexion of many of the younger part of the inhabitants betrayed, I never received marks of attention without a demand on my generosity.'—*Travels*, pp. 52, 53.

ELEPHANTIASIS, so named from the legs of people affected with this disorder growing rough and wonderfully large, like the legs of an elephant, is a disease that mostly attacks the feet. It is known by the skin being thick, rough, wrinkly, unctuous and void of hair, and mostly without the sense of feeling. It is said to be contagious. Cullen ranks it in the class cachexiæ, and order impetigines. At first very severe pain is felt in one of the inguinal glands, which, after a short time, becomes hard, swelled, and inflamed. No suppuration, however, ensues; but a red streak may be observed running down the thigh from the swelled gland to the leg. As the inflammation increases in all the parts, the fever gradually abates, and perhaps, after two or three days' continuance, goes off. It, however, returns again at uncertain periods, leaving the leg greatly swelled with varicose turgid veins, the skin rough and rugged, and a thickened membrana cellulosa. Scales appear also on the surface, which do not fall off, but are enlarged by the increasing thickness of the membranes; uneven lumps, with deep fissures, are formed, and the leg and foot become at last of an enormous size.

A person may labor under this disease many years; and perhaps the chief inconvenience he will experience is the enormous bulky leg which he drags about with him. The incumbrance has, indeed, induced many to submit to an amputation; but the other leg then frequently becomes affected. See MEDICINE.

ELEPHANTINE, in Roman antiquity, an appellation given to the books wherein were registered the transactions of the senate and magistrates of Rome, of the emperors or generals of armies, and even of the provincial magistrates; the births and classes of the people, and other things relating to the census. They are supposed to have been so called, from the leaves being made of ivory.

ELEPHANTOPUS, in botany, a genus of the polygamia segregata order, and syngenesia class of plants: natural order forty-ninth, compositæ: CAL. quadriflorous, with hermaphrodite florets ligulated or plain; receptacle naked; the pappus bristly. Species six, one an oriental herb, the rest West India plants.

ELEPHAS, the elephant, in zoology, a genus of quadrupeds belonging to the order bruta. The characters, as defined by Linnæus and Gmelin, are these: 'He has no fore teeth in either jaw, and no tusks in the lower jaw; the tusks of the upper jaw are very long, and stretch far out of the mouth: has a long, extensible, and flexible, cartilaginous trunk, or proboscis, on the nose, which is capable of laying hold even of very minute objects. The body is almost naked.' There is only one known species, called by way of distinction from the American elephant, which is quite a different genus, E. maximus, or the great elephant. He is the largest of all land animals. From the front to the origin of the tail he is generally about sixteen feet long, from the end of the trunk twenty-five feet, and about fourteen feet high. The circumference of the legs is about six feet. These are the largest dimensions. But

the animal differs in size in different countries; in some not exceeding seven feet in height. The eyes are small in proportion to the size of the head. The muzzle is very different from that of any other quadruped: it is nothing but the origin of a long trunk which hangs between the two large tusks; the mouth appears behind the trunk, which serves in place of an upper lip, and the under lip terminates in a point. The feet are short, round, clumsy, and only distinguishable by the toes. The trunk is, properly speaking, the nose extended, and terminated by a couple of nostrils. But, besides serving as an organ of smell, the trunk performs all the functions of a strong and dexterous arm. The trunk of an elephant is about eight feet long, five feet and a half in circumference near the mouth, and one foot and a half near the extremity: it is a pipe of an irregular conical figure, and widened at the end: the superior side of the trunk is convex, and furrowed transversely; and the inferior side is flat, and has two longitudinal rows of small protuberances resembling the tentacula of the silkworm and most other caterpillars. The upper part of the trunk corresponds with the extremity of the nose in other quadrupeds, and answers the same intention; the inferior part serves as an upper lip, including the nostrils at the same time. For the trunk is a continued canal, divided into two cavities by a longitudinal partition: these cavities ascend along the fore part of the upper jaw, where they make a turn inward, and descend into the palate, terminating in two separate orifices; they have likewise each a separate orifice at the end of the trunk. At the place where these cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate situate in such a manner as enables the animal to shut the canal, and to prevent the water with which it occasionally fills the trunk from entering into the passage of the nose, where the organs serving for the sensation of smell are placed. The elephant can move the trunk in all directions; he can extend or shorten it at pleasure, without altering the diameters of the two canals within. By this means respiration is not interrupted, whatever be the situation of the trunk; and the water is allowed to remain till the animal chooses to throw it out by an expiration. Each canal is lined with a smooth strong membrane, and the surface of the trunk is covered with another strong membrane or skin. The substance contained between the exterior and interior membranes, is a composition of longitudinal and transverse muscles, which serve to extend and contract the length of the trunk. At the extremity of the trunk there is a concave protuberance, in the bottom of which are the two passages of the nostrils. The inferior part of the protuberance is thicker than the sides, and the superior part is stretched out like a finger about five inches long; which, together with the edges of the whole extremity of the trunk, takes on different figures according to the necessities of the animal. It is by this organ that the animal lays hold of food or other substances; and he manages it with as much dexterity as a man does his hand, taking up grains of corn, or the smallest piles of grass, and conveying them to his mouth. When he drinks, he thrusts his trunk into the water, and fills it by drawing in his breath and exhausting the air: when the trunk is thus filled with water, he can either throw it out to a great distance, or drink it by putting the end of the trunk in his mouth. The two large tusks, which some call the horns, of the elephant, are of a yellowish color, and extremely hard. The bony substance of which they are composed is known by the name of ivory, and much used in different branches of manufacture. The ears are very large, and resemble those of an ape. The skin of the elephant has but few hairs on it, placed at great distances from each other. It is full of wrinkles, like those on the palm of a man's hand, besides many chapped and greasy ridges. The female has two dugs, one on each side of the breast.

The female elephant has not, like other quadrupeds, the orifice of the vagina adjacent to the anus; for it is situated nearly in the middle of the belly, about two and a half or three feet distant from the anus. Naturalists, as well as travellers, agree in affirming that the male organ of the elephant exceeds not either in length or diameter that of a horse. Although, for this reason, Buffon, Linnæus, and other eminent writers, have made their coition a subject of considerable controversy, yet, as they have since been observed to cover like the horse, the subject is not worth pursuing. As to the time of gestation, which Buffon limits to nine months, the best modern authorities consider it to be about twenty months. They bring forth but one at a time; which, on coming into the world, is as large as a wild boar, and is furnished with teeth: however, the large tusks do not make their appearance till some time after, and at the age of six months they are several inches long. Elephants of this age are as large as an ox in a natural state.

Elephants, even in a savage state, are peaceable and gentle creatures. They never use their weapons but in defence of themselves or their companions. Their social dispositions are so strong, that they are seldom found alone, but march always in large troops: the oldest and most experienced lead the van; the young and the lame keep in the middle; and those of the middle age walk in the rear. The females carry their young on their tusks, embracing them at the same time with their trunk. They seldom march in this regular order but when they reckon the journey dangerous, such as an expedition to cultivated lands, where they expect to meet with resistance. On other occasions they are less cautious; some of them falling behind or separating from the rest, but seldom so far as to be beyond the reach of assistance from their companions. It is dangerous to offer them the least injury; for they run straight upon the offender; and, though the weight of their body be great, their steps are so large, that they easily outrun the swiftest man, whom they either pierce with their tusks, or seize with their trunk, dart him in the air, and then trample him under their feet. Travellers who frequent these countries kindle large fires, and beat drums during the night, to prevent their approach. After being once attacked by men, or falling into any ambush, they never forget the in-

jury, but search for every opportunity of revenge. As they are probably endowed with a more exquisite sensation of smell than any other animal, owing to the great extent of their nose, they can scent a man at a very great distance, and trace him by his footsteps. Elephants are peculiarly fond of the banks of rivers, deep valleys, and marshy grounds, especially when well shaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuse themselves in dashing it around. They cannot endure cold, and are equally averse to heat. To avoid the scorching sun, they retire to the thickest and most shady parts of the forest. The bulk of their bodies is so enormous, that they do not choose to go into deep waters so frequently as some other quadrupeds; although the length of their trunk, which they can raise straight up to respire, is a great advantage in swimming. Their ordinary food is roots, herbs, leaves, the tender branches of trees, fruits, and grains; but they abhor flesh or fish. As they devour a large quantity of food in a short time, they often shift their pasture; when they meet with cultivated grounds, they make a prodigious desolation, and destroy more plants by their feet than they use for nourishment; which last is very considerable, amounting to 150 pounds of herbage every day: by this means, as they constantly graze in large troops, they lay waste whole fields in an hour. The Indians and negroes employ every art to prevent them from visiting their cultivated lands, making great noises, and burning large fires round their fields. However, these precautions are not always sufficient to prevent the elephants from visiting them. They chase away the domestic animals, put the men to flight, and sometimes even throw down their habitations. Elephants are hardly susceptible of fear: the only method to stop their course is by fire or fireworks, the effects of which being sudden and quickly repeated, the elephants frequently turn back; and, when one runs, all the rest instantly follow him.

In Ceylon, where these noble animals principally abound, a considerable trade is carried on in live elephants. They are caught in various snares, and then exported to different parts of India, where they fetch a considerable price. 'At Gannitherê,' says Dr. Davy, in his interesting work on Ceylon, 'close to the foot of the mountain, we went off the road about half a mile over paddy-fields, to visit an elephant snare, situated in a narrow part of the valley. The snare is merely a square space of small dimensions surrounded by strong palisades, having a tree in the middle and one narrow entrance. The manner in which elephants are here taken is very simple. The wild animals are first driven to Kandy, and then, if approved of, to this place. When an elephant enters the enclosure, he is fastened to the tree by means of a noose, and his feet are properly secured by strong ropes. From the enclosure he is led to an adjoining spot; a shed is built over him; his feet are tied firmly to the trees, and he is not allowed to lie down. We found six elephants in progress of taming—their limbs more or less shackled, according to the subjugation effected. They were all extremely lean, and miserable objects to look at. More than half of those caught, die during their confinement: they seem to pine for the lost blessing of liberty; they refuse to eat, and generally die of starvation. If they can be prevailed on to take food, the difficulty of the task is got over, and they are soon tamed. Great as the mortality is in this instance, it is small in proportion to that which takes place in a large snare, such as is used in the low country.'

Our author then refers to the following account of the large snare used in the low and maritime countries, in Mr. Cordiner's Travels in Ceylon. The hunt alluded to took place near the elephant snare at Kotaway, only a few miles distant from Tengalle. The governor and his suite attended on this occasion, and the whole of the party employed was not fewer than 3000 persons. The whole of this multitude surrounded the forests in which elephants are discovered to abound, with a chain of fires placed on moveable stands, so as to be brought closer, according as the elephants are driven nearer to the centre. The distance between the fires may at first have been 100 paces, which is gradually reduced to about ten paces. The more the elephants are confined, the more vigilant the hunters must become, and prepared to repel their efforts to escape, by advancing the fires, and by loud shouting. At the end of two months, they thus become enclosed in a circle, of which the wide entrance of the snare forms a part, and are at last brought so near to it, that, by the exertions of the surrounding multitude, they can be made close prisoners in a few hours. It is now that all those who are desirous of witnessing the capture resort to the scene of action.

An idea of the enclosure may be formed by drawing, on a piece of paper, the outline of a wide funnel. A little way within the wide end, a palisade runs across, in breadth 600 feet, containing four open gates, at which the elephants enter. A view of two of these is commanded from a bungaloe, erected for spectators on pillars thirty feet from the ground. The enclosure is formed of the strongest trees on the island, from eight to ten inches in diameter, bending inwards, sunk four feet into the ground, and from sixteen to twenty feet high above it. They are placed at the distance of sixteen inches from each other, and crossed by four rows of powerful beams, bound fast to them with pliant canes. To this palisade are added supporters more inclined, several feet asunder, augmenting the strength of the fence. The part of it in which the elephants are first enclosed is 1800 feet in circumference: but it communicates with a smaller fold, 100 feet in length, and forty broad, through which a rivulet passes, five feet in depth, and nearly fills the enclosure. The elephants enter this place of confinement at only one gate; and beyond the water the fence gradually contracts, terminating in a strong passage, five feet broad, and 100 feet long.

When the first enclosure is completely stocked, the four gates are closed and secured with strong stakes. Then another chain of fires and torches is formed within the enclosure, and the persecuted animals are driven forward in like manner into the smaller fold.

'At sunrise,' continues Mr. Cordiner, 'we became spectators of a most extraordinary sight. So great a number of enormous animals crowded into so small a compass, is a spectacle rarely to be seen. Pressing heavily upon one another, incapable of almost any movement but convulsions of distress, their paroxysms of anguish could not be contemplated without emotion. No person could find language to express his feelings. All were struck dumb with a species of astonishment hitherto unexperienced. The most hazardous part of the business remains, that of seizing on the elephants at the end of the long passage, which is the only outlet from the water snare. They are driven in one by one, making furious efforts to regain their liberty on finding themselves prisoners. When they reach the gate at the end, strong beams are inserted across the passage behind, to prevent them from retreating. Men then approach, and bind their hind legs with great ropes, and five or six turns of smaller cordage are passed round their necks. While these operations are going on, a man stands before the gate of the passage, tickling the elephant's trunk, and diverting his attention. In this manner they are secured, yet accidents frequently happen at this time. On the present occasion, one unfortunate man tumbled into the passage, and was instantly trampled to death under the feet of an enraged elephant. They frequently press against one another in the water snare and the passage with so much violence, that some are squeezed to death, or drop down dead with fatigue.'

When the wild elephant is completely harnessed, two tame elephants, trained to the business, are brought to the gate, and placed one on each side of it. These immediately survey the prisoner whom they have to conduct, feel his mouth to know whether or not he has tusks, and lay hold of his proboscis to ascertain what degree of resistance he is likely to make. Ropes are passed through the collar of the wild elephant, and made fast to similar collars on each side of the tame ones. The bars of the gate are then unloosed, and drawn out; and the wild captive darts forward directly between the two tame elephants: he can, however, only advance a little way, as the ropes securing his hind legs still continue fastened to the strong stakes of the toil. In this situation he remains, until the riders mounted on the tame elephants have drawn tight the cords, which bind him to the necks of his half-reasoning conductors.

During this operation, he endeavours to undo with his trunk some of the knots which have been made, and often attempts to give a destructive blow to the diminutive creatures so actively engaged in confirming his captivity. But the two tame animals, who are vigilantly observant of all his motions, never fail to prevent him from doing any mischief, by gently lowering his proboscis with their own: if he continue long refractory, they batter him with their heads, and at last produce the most obsequious submission. The nooses of the ropes are then opened, leaving his hind legs at freedom, and himself entirely disengaged from the snare. The two tame elephants press close on each side of him, and proceed, in pompous procession, to the garden of stalls, where they deliver up their charge to experience another species of hardships. The marching off of this venerable trio is a sight truly magnificent, and exhibits a noble specimen of the skill of man, united with the sagacity of the elephant.

In this manner the prisoner is conducted to a grove, where, if he is of an ordinary size, he is sufficiently secured by being placed lengthwise between two trees, to one of which his hind legs are bound, and one of his fore legs to the other. A more complicated apparatus of ropes and stakes is necessary for those which are remarkable for strength and fury. The tame conductors then move away to secure another captive. An elephant may frequently be tamed in eight or ten days, though in other instances, months are required. When tamed, they are marched round to Jaffnapatam, there sold by public auction, and thence exported to the opposite continent.

The elephant, when tamed, is the most friendly and obedient of all animals: he is entirely attached to the person who feeds and takes care of him. In a short time he understands signs, and the sound of his master's voice. He distinguishes the language of passion, of command, of satisfaction, and acts accordingly. He receives his orders with attention, and executes them with alacrity, but without precipitation. He easily learns to bow his knees and lower his body, for the convenience of those who mount him He lifts burdens with his trunk, and assists those who are loading him in laying them on his back. He delights in shining harness and trappings. When yoked in a cart or waggon, he pulls equally and cheerfully, unless he be abused by injudicious chastisements. His guide is generally mounted on his neck, with a small rod of iron, sharp at the point, in his hand; he directs his motion by pricking him on the ears and head; but for the most part a word is sufficient A tame elephant will do more labor than six horses, but he requires a proportional quantity of food. They are the principal beasts of burden in many parts of Africa and the East Indies. They carry sacks and bundles of all kinds on their necks, backs, and tusks. They seldom lose or damage any thing committed to their care: they will stand on the edge of a river, take bundles off their necks and tusks, lay them carefully in a boat wherever they are desired, and try with their trunk whether they are properly situated; if they be loaded with casks they go in quest of stones to prop them and prevent them from rolling. When the elephant is properly managed he lives very long, even in a state of slavery and labor. That some have lived in this state 130 years is pretty well authenticated. In a natural state they often exceed 200 years, and propagate their species till they are 120: It is thirty years before they come to their full growth. The elephants inhabit India, and some of its greater islands, Cochin China, and some of the provinces of China. They abound in the southern parts of Africa, from the river Senegal to the Cape; and from thence as high as Ethiopia on the other side. They are found in the greatest numbers in the interior parts, where there are

vast forests, near the sides of rivers. The wild elephants of Ceylon live in troops or families, distinct and separate from all others, and seem o avoid the strange herds with peculiar care. When a family removes from place to place, the largest tusked males put themselves at the head, and if they meet with a large river are the first to pass it. On arriving on the opposite bank they try whether the landing place is safe: if it be, they give a signal of a note from the trunk as if it were the sound of a trumpet, on which the remaining part of the old elephants swim over; the little elephants follow, holding one another by locking their trunks together, and the rest of the old ones bring up the rear. In the woods is often seen a solitary male elephant, wandering like an outlaw, banished from the herd and all the race. In this solitary state, as if in a state of desperation, they are very dangerous. A single man will put to flight whole herds of social elephants: the solitary one fears not his presence, but will stand firm, putting his power to defiance. Elephants are not domesticated in Africa as in the more civilised parts of Asia, although they are much more numerous. In some parts of Africa they swarm so, that the negroes are obliged to make their habitations under ground for fear of them. They are killed and eaten by the natives, and the trunk is said to be a delicious morsel. In the Philosophical Transactions for 1799, we find some curious particulars relative to the natural history of the elephant, by Mr. Corse, who, during his residence in India, had investigated the subject with considerable attention. A female elephant has been known to forget her young one in the short space of two days' separation, and to repel its advances. It is also said, that an elephant which had escaped from its confinement suffered itself to be again trepanned, and reconducted to its state of captivity. According to Mr. Corse, both male and female elephants are divided by the natives of Bengal into two castes, viz. koomareah and the merghee; the former consisting of the large or full bodied kind; the latter of the more slender, with longer legs and proportionably thinner trunk. The merghee is also a taller animal than the koomareah, but not so strong. Many indistinct varieties are again produced from the intermixture of these two breeds. A large trunk is always considered as a great beauty in an elephant, so that the koomareah is always preferred, not only on this account, but for his superior strength in carrying burdens, &c. The torrid zone appears to be the natural clime of the elephant, and the most favorable for the production of the largest and hardiest race; and, when this animal migrates beyond the tropics, the species degenerates. Elephants are taken on the Malabar coast, as far north as the territories of Coorgah Rajah, but these are considered by Mr. Corse as much inferior to the Ceylonese elephant. In some female elephants the tusks are so small as not to appear beyond the lip, whilst in others they are large and long. In both sexes the grinders are very much alike. The largest tusks, and those which furnish the best ivory, are found in a variety of the male elephant, called dauntelah, from this circumstance, in opposition to another called mooknah, whose tusks do not exceed those of some females. An elephant is considered perfect when his ears are large and rounded, not ragged or indented at the margin: his eyes of a dark hazel color, free from specks: the roof of his mouth and his tongue without dark or blackish spots of any considerable size: his trunk large: his tail long, with a tuft of hair hanging almost to the ground. His fore-feet must have five nails on each, and the hinder ones four; his head well set on and carried rather high: the arch or curve of his back rising gradually from the shoulder to the middle, and thence descending to the insertion of the tail. All his joints must be firm and strong. In one variety of the elephant the tusks point downwards, projecting only a little way beyond the trunk. The tusks in elephants are fixed very deep in the upper jaw; and the root or upper part, which is hollow, and filled with a core, goes as high as the insertion of the trunk, round the margin of the nasal opening of the throat, which opening is just below the protuberance of the forehead.

The elephant breathes through this opening, and by its means sucks up water into his trunk: between it and the roots of the tusks there is only a thin bony plate. The first or milk tusks of an elephant are shed between the first and second year, when scarcely two inches in length. The time when the tusks cut the gums varies considerably; some young elephants have tusks at five months, and others not till seven; yet these deciduous tusks are formed in a fœtus arrived at its full time. A young elephant was observed to shed one of its milk tusks, on the 6th of November, 1790, when only about thirteen weeks old, and the other on the 6th of December the same year: about two months after, the permanent ones cut the gums; and on the 19th of April, 1791, they were an inch long. Another young elephant was sixteen months before he shed his milk tusks; so various is the time of this process. The permanent tusks of the female are small, compared with those of the male; and do not take their rise so deep in the jaw. The tusks are increased by layers of ivory arising internally from the core on which they are formed; similar to the growth of the horns of some animals. The largest elephant tusks Mr. Corse ever saw, in Bengal, did not exceed the weight of 72 lbs. avoirdupois: at Tiperah, they seldom weigh more than 52 lbs. each. But those brought from other parts to the India-house, far exceed either of these weights, some of them weighing 150 lbs. each. Mr. Corse supposes these to come from Pegu. The Asiatic elephant is said to be larger than the African; yet the ivory dealers in London affirm that the largest tusks come from Africa; and that they are of a better texture, and less liable to turn yellow than the Indian ones. From the earliest accounts in history, the eastern nations have employed elephants in war; Alexander the Great was the first European who ever mounted an elephant. He carried a number of them into Greece, which Pyrrhus employed some years after against the Romans at the battle of Tarentum. Both the Greeks and Romans soon learnt to get the better of those monstrous animals: they opened their ranks and

allowed them to pass through; neither did they attempt to hurt them, but threw darts, &c., at their guides. Now that fire-arms are the principal instruments of war, elephants, who are terrified at the noise and flame, instead of being useful, would only embarrass and confuse an army. However, in Cochin and other parts of Malabar, and in Tonquin, Siam, and Pegu, where fire-arms are little understood, they are still used in battle. The guide sits astride upon the neck, and the combatants sit or stand upon the other parts of the body. They are also extremely serviceable in fording rivers, and carrying over the baggage on their backs. After the keepers have loaded them with several hundred weight, they fasten ropes to them; of which the soldiers taking hold, either swim or are drawn across the river. In time of action, they sometimes fix a heavy iron chain to the end of their trunks, which they whirl round with such agility, as to make it impossible for an enemy to approach them at that time. Another use they still have for this creature in war, is to force open the gates of a city or garrison which is closely besieged. This he does by forcing himself against them with his whole weight, till he has burst the bars: to prevent which, most of the garrisons in this country have large spikes stuck in their gates, that project to a considerable distance. But these prodigious animals are kept more for show and grandeur than for use, and their keeping is attended with a very great expense; for they devour vast quantities of provision, and must sometimes be regaled with a plentiful repast of cinnamon, of which they are excessively fond. It is said to be no uncommon thing with a Nabob, if he has a mind to ruin a private gentleman, to make him a present of an elephant, which he is ever afterwards obliged to maintain at a greater expense than he can afford: as, by parting with it, he would certainly fall under the displeasure of the grandee, besides forfeiting all the honor which his countrymen think is conferred upon him by so respectable a present.

EL'EVATE, *v. a.* & *part. adj.*
ELEVA'TION, *n. s.*
EL'EVATOR.
} Fr. *elever*; Span. *elevar*; Port. *alavantar*: Ital. and Lat. *elevare*; from *levis*, light, i.e. easily lifted. To lift up; also to make light; lessen by detraction. For the particular use of elevation, see the article following.

When the judgments of learned men are alledged against you, what do they but either *elevate* their credit, or oppose unto them the judgments of others as learned? *Hooker.*

All which different *elevations* of spirit unto God are contained in the name of prayer. *Id.*

His style was an elegant perspicuity, rich of phrase, but seldom any bold metaphors; and so far from tumid, that it rather wanted a little *elevation*. *Wotton.*

To mischief swift, hope *elevates*, and joy
Brightens his crest. *Milton.*

On each side an imperial city stood,
With towers and temples proudly *elevate*
On seven small hills. *Id.*

Some latitudes have no canicular days, as those which have more than seventy-three degrees of northern *elevation*, as Nova Zembla.
*Browne's Vulgar Errours.*

Where the hand is used to the plough and the spade, the head is seldom *elevated* to sublime notions, or exercised in mysterious reasoning. *Locke.*

Angels, in their several degrees of *elevation* above us, may be endowed with more comprehensive faculties. *Id.*

We are therefore to love him with all possible application and *elevation* of spirit, with all the heart, soul, and mind. *Norris.*

This subterranean heat or fire, which *elevates* the water out of the abyss. *Woodward.*

The disruption of the strata, the *elevation* of some, and depression of others, did not fall out by chance, but were directed by a discerning principle. *Id.*

Those among the nobles who wished for a reformation in religion, dreaded his severity, and others considered the *elevation* of a churchman to the highest office in the kingdom as a depression of themselves.
*Robertson. History of Scotland.*

Kings are naturally lovers of low company. They are so *elevated* above the rest of mankind, that they must look upon all their subjects as on a level.
*Burke.*

The *elevation* of the mind ought to be the principal end of all our studies, which, if they do not in some measure effect, they are of very little service to us.
*Id.*

Some headless hero, or some Cæsar, shows—
Defective only in his Roman nose;
Exhibits *elevations*, drawings, plans,
Models of Herculanean pots and pans;
And sells them medals, which, if neither rare
Nor ancient, will be so, preserved with care.
*Cowper.*

ELEVATION OF THE HOST, in the church of Rome, that part of the mass where the priest raises the host above his head for the people to adore.

ELEVATOR, in anatomy, the name of several muscles, so called from their serving to raise the parts of the body to which they belong.

ELEVATOR, in surgery, an instrument for raising depressed portions of the skull. Besides the common elevator, several others have been invented, as, for instance, the tripod elevator, and another, which was first devised by M. I. L. Petit, and afterwards improved by M. Louis: but as all the best modern surgeons give the preference to the common one, which is most simple and is found to answer every desirable purpose, we shall not undertake the description of these more complicated instruments. The common elevator is in fact a mere lever, the end of which is somewhat bent, and made rough, in order that it may be less apt to slip away from the piece of bone which is to be raised. This instrument may be used by forming a fulcrum for it, either in the hand which holds it, or on the fingers of the other hand; or the operator may make a fixed point for it on the edge of the opening made with the trephine, or of that which the accidental violence has occasioned. See TREPANNING.

ELEV'EN, *adj.*
ELEV'ENTH.
} Sax. ænleꝼen (æn, one, and lyꝼan, to leave), one left, i. e. above ten, or after the enumeration of ten, as Skinner suggests. See TWELVE.

And thei bithoughten on his wordis, and thei geden agen fro the graue; and teelden alle these thingis to the *ellevene* and to alle othere.
*Wiclif. Luk* 24.

Had I a dozen sons, and none less dear than Marcius, I had rather *eleven* die nobly for their country, than one voluptuously forfeit out of action.
*Shakspeare.*

In the *eleventh* chapter he returns to speak of the building of Babel. *Raleigh's History.*

I know not wherein Lewis the *Eleventh* shewed himself unwitty, but in the charge which he gave to his son, to learn no more Latin. *Bp. Hall.*

ELEUSINIA, in Grecian antiquity, a festival held in honor of Ceres, every fourth year by some states; by others every fifth. The Athenians celebrated it at Eleusis, whence the name. Here stood the memorials of her presence and of her bounty; the well, Callichorus, by which she had rested, in the reign of Erectheus; the stone on which she sat, named the sorrowful; the Rharian plain, where barley was first sown; and the threshing floor and altar of Triptolemus, a herdsman whom she instructed in the culture of that grain, the use of which succeeded to acorns. The mystic temple, provided by Pericles for the solemnity, was unequalled for beauty and magnitude. The profane or uninitiated were forbidden to enter it on any pretence; and any intrusion was punished with death. The chief priest, Ιεροφάντης, was taken from the Eumolpidæ, a holy family at Athens, descended from Eumolpus, a shepherd and favorite of Ceres. He was enjoined celibacy, and wore a long garment, and a wreath of myrtle. Under him, besides many of inferior station, was the torchbearer, δαδόυχος, who had likewise his hair bound with a fillet; the priest, who officiated at the altar, thence called ο επι βωμῶ; and the sacred herald, Κηρυξ. The latter was of a family which claimed the god Mercury and Aglauros the daughter of Cecrops for its ancestors. The secrecy in which the mysteries were enveloped was so strict, that no person was allowed even to name the hierophant by whom he had been initiated. Public abhorrence and detestation awaited the babbler, and the law condemned him to death. The Athenians at first suffered none but citizens to be initiated into these mysteries. This regulation, which compelled Hercules, Castor, and Pollux, to become citizens of Athens, was strictly observed in the first ages of the institution, but afterwards all persons, barbarians excepted, were freely initiated. The Eleusinia were divided into the greater and lesser mysteries. Μυστήρια μεγάλα και μικρά. The lesser were instituted from the following circumstances:—Hercules passed near Eleusis while the Athenians were celebrating the mysteries, and desired to be initiated. As this could not be done, because he was a stranger, and as Eumolpus was unwilling to displease him on account of his great power, and the services which he had done to the Athenians, another festival was instituted, and Hercules was solemnly admitted to the celebration and initiated. In later times the smaller festivals were preparatory to the greater, and no person could be initiated at Eleusis without a previous purification at Agræ. This purification they performed by keeping themselves pure, chaste, and unpolluted, during nine days; after which they came and offered sacrifices and prayers, wearing garlands of flowers, called, ισμερα or ιμερα, and having under their feet Διος κωδιον, Jupiter's skin, which was the skin of a victim offered to that god. The person who assisted was called ὑδρανος, from υδωρ water, which was used at the purification, and they themselves were called μυσται, the initiated. A year after the initiation at the less mysteries they sacrificed a sow to Ceres, and were admitted in the greater, and the secrets of the festivals were solemnly revealed to them, from which they were called εφοροι and εποπται, inspectors. This festival was observed in the month Boedromion or September, and continued nine days from the 15th till the 23rd. During that time it was unlawful to arrest any man or present any petition, on pain of forfeiting 1000 drachmas, or, according to others, on pain of death. If any woman rode to Eleusis in a chariot, she was obliged by an edict of Lycurgus to pay 6000 drachmas. The design of this law was to destroy all distinction between the rich and poor citizens. When the season approached, the mystæ, or persons who had been initiated only in the lesser mysteries, repaired to Eleusis to be instructed in the ceremonial. The first day was called αγορμος, an assembly, because the mystæ then first assembled together. The service for the opening of the temple, with morning sacrifice, was performed. The ritual, which was called Petroma,* and consisted of two stones exactly fitted, was then produced. The mysterious record was replaced after the reading, and closed up until a future festival. The principal rite was nocturnal, and confined to the temple and its environs. The mystæ waited without, with impatience and apprehension. Lamentations and strange noises were heard. Flashes of light and of fire rendered the deep succeeding darkness more terrible. They were beaten, and perceived not the hand. They beheld frightful apparitions, monsters, and phantoms of a canine form. They were filled with terror, became perplexed and unable to stir. The scene then suddenly changed. The propylæa or vestibules of the temple were opened and the curtains withdrawn. They were introduced by the hierophant and daduchus, and the former showed them the mysteries. The splendor of the illumination, the glory of the temple and of the images, the singing and dancing which accompanied the exhibition, all contributed to sooth the mind after its late agitation, and to astonish the wondering devotee. After this inspection, called αυτοψια, they retired, and others advanced. The succeeding days were employed in purification, in sacrifice, in pompous processions, and spectacles, at which they assisted, wearing myrtle crowns. The second day was called αλαδε μυσται, i. e. to the sea, you that are initiated; because they were commanded to purify themselves by bathing in the sea. On the third day sacrifices, and chiefly a mullet, were offered; also barley from a field of Eleusis. These oblations were called Θυα, and held so sacred that the priests themselves were not permitted to partake of them. On the fourth day they made a solemn procession, in which the καλαθιον, or holy basket of Ceres, was carried about in a consecrated cart, while on every side

the people shouted χαιρε Δημητερ, Hail Ceres! After these followed women called κιστοφοροι, who carried baskets, in which were sesamum, carded wool, grains of salt, a serpent, pomegranates, reeds, ivy boughs, certain cakes, &c. The fifth was called Ἡ των λαμπαδων ημερα, the torch day; because on the following night the people ran about with torches in their hands. It was usual to dedicate torches to Ceres, and contend who should offer the biggest, in commemoration of the travels of the goddess, and of her lighting a torch in the flames of mount Ætna. The sixth day was called Ιακχος, from Iacchus, the son of Jupiter and Ceres, who accompanied his mother in her search after Proserpine, with a torch in his hand. From that circumstance his statue had a torch in his hand, and was carried in solemn procession from the Ceramicus to Eleusis. The statue, with those that accompanied it, called Ιακχαγωγοι, was crowned with myrtle. In the way nothing was heard but singing and the noise of brazen kettles as the votaries danced along. The way through which they issued from the city was called Ιερα οδος, the sacred way; the resting place was Ιερα συκη, from a fig-tree, which grew in the neighbourhood. They also stopped on a bridge over the Cephisus, where they derided those that passed by. After they had passed this bridge, they entered Eleusis by a place called μυστικη εισοδος, the mystical entrance. On the seventh day there were sports, in which the victors were rewarded with a measure of barley, as that grain had been first sown in Eleusis. The eighth day was called Επιδαυριων ημερα, because once Æsculapius at his return from Epidaurus to Athens was initiated by the repetition of the less mysteries. It became customary, therefore, to celebrate them a second time upon this, that such as had not hitherto been initiated might be lawfully admitted. The ninth and last day of the festival was called Πλημοχοαι, earthen vessels, because it was usual to fill two such vessels with wine; one placed towards the east, and the other towards the west, which, after the repetition of some mystical words, were both thrown down, and the wine being spilt on the ground was offered as a libation. The story of Ceres and Proserpine, the foundation of the Eleusinian mysteries, was partly verbally delivered, and partly represented in allegorical show. Proserpine was gathering flowers when she was stolen by Pluto. Hence the procession of the holy basket, which was placed on a car dragged along by oxen, and followed by a train of females, some carrying the mystic chests, shouting, Hail, Ceres! At night a procession was made with lighted torches, to commemorate the goddess searching for her daughter. A measure of barley, the grain which it was believed she had given, was the reward of the victors in the gymnastic exercises; and the transaction at the temple had a reference to the legend. Some, however, have supposed the principal rites at this festival to have been obscene and abominable, and that thence proceeded all the mysterious secrecy. They were carried from Eleusis to Rome in the reign of Adrian, where they were observed with the same ceremonies as before, though perhaps with more licentiousness. They lasted about 1800 years, and were at last abolished by the emperor Theodosius.

ELEUSIS, the modern Lefchimo, was, in ancient geography, a town of Attica, between Megara and the Piræus, and celebrated for the festivals of Ceres; rites not finally extinguished in Greece until the invasion of Alaric the Goth. Eleusis, on the overthrow of its goddesses and the cessation of its mysteries, became soon an obscure place, without character or riches. For some ages, however, it was not entirely forsaken. The port was small and of a circular form; the stones of one pier were seen by Chandler above water, and the corresponding side was traced. About half a mile from the shore he found a long hill which divided the plain. In the side next the sea were traces of a theatre, and on the top cisterns cut in the rock. In the way to it some masses of wall and rubbish, partly ancient, were standing, he says; and beyond some other ruins a long broken aqueduct crossed to the mountains. The Christian pirates had infested the place so much, that in 1676 it was abandoned. It is now a small village at the eastern extremity of the rocky brow, on which was once a castle, and is inhabited by a few Albanian families, employed in the culture of the plain. The mystic temple at Eleusis was planned by Ictinus, the architect of the Parthenon. Pericles was overseer of the building. It was of the Doric order; the cell so large as to admit the company of a theatre. The columns on the pavement within, and their capitals, were raised by Coræbus. Metagenes, of Xypete, added the architraves and the pillars above them, which sustained the roof. Another completed the edifice. This was a temple in antis, or without exterior columns, which would have occupied the room required for the victims. The aspect was changed to Prostylos, under Demetrius, the Phalerian; Philo, a famous architect, erecting a portico, which gave dignity to the fabric, and rendered the entrance more commodious. The site was beneath the brow, at the east end, and encompassed by the fortress. Some marbles, which are uncommonly massive, and some pieces of the columns, remain on the spot. The breadth of the cell is about 150 feet; the length, including the pronaos and portico, is 216 feet; the diameter of the columns, which are fluted six inches from the bottom of the shafts, is six feet and more than six inches. The temple was a decastyle, or had ten columns in the front, which was to the east. The peribolus, or enclosure, which surrounded it on the north-east and on the south side, measures 387 feet in length from north to south, and 328 feet in breadth from east to west. On the west side it joined the angles of the west end of the temple in a straight line. Between the west wall of the enclosure and temple and the wall of the citadel was a passage of forty-two feet six inches wide, which led to the summit of a high rock at the north-west angle of the enclosure, on which are visible the traces of a temple in antis, in length seventy-four feet six inches from north to south, and in breadth from the east to the wall of the citadel, to which it joined on the west, fifty-four feet. It was perhaps that sacred to Triptolemus.

This spot commands a very extensive view of the plain and bay. About three-fourths of the cottages are within the precincts of the mystic temple, and the square tower stands on the ruined wall of the enclosure. At a small distance from the north end of the enclosure is a heap of marble, consisting of fragments of the Doric and Ionic orders, remains, it is likely, of the temples of Diana Propylea and of Neptune, and of the Propyleum or gateway. Wheeler saw some large stones carved with wheat ears and bundles of poppy. Near it is the bust of a colossal statue of excellent workmanship, maimed, and the face disfigured; the breadth at the shoulders, as measured by Pococke, five feet and a half; and the basket on the head above two feet deep. It probably represented Proserpine. In the heap are two or three inscribed pedestals; and on one are a couple of torches, crossed. Another cross seems to have belonged to the statue of a lady, who was hierophant or priestess of Proserpine, and had covered the altar of the goddess with silver. A well in the village was perhaps that called Callichorus, where the women of Eleusis were accustomed to dance in honor of Ceres. A tradition prevails, that, if the broken statue be removed, the fertility of the land will cease. The modern town does not contain more than thirty houses.

ELEUTHERIA, a festival, celebrated at Platæa, in honor of Jupiter Eleutherius, or the assertor of liberty, by delegates from almost all the cities of Greece. Its institution originated in this:—After the victory obtained by the Grecians, under Pausanias, over Mardonius the Persian general, in Platæa, an altar and statue were erected to Jupiter Eleutherius, who had freed the Greeks from the tyranny of the barbarians. It was further agreed upon in a general assembly, by the advice of Aristides, the Athenian, that deputies should be sent every fifth year, from the different cities of Greece, to celebrate Eleutheria, festivals of liberty. The Platæans celebrated also an anniversary festival in memory of those who had lost their lives in that famous battle on the sixteenth of the month Mæmacterion, a procession was made with a trumpeter at the head, sounding a signal for battle. After him followed chariots loaded with myrrh, garlands, and a black bull, and certain free young men, as no signs of servility were to appear during the solemnity, because they in whose honor the festival was instituted had died in the defence of their country. They carried libations of wine and milk in large-eared vessels, with jars of oil, and precious ointments. Last of all appeared the chief magistrate, who, though not permitted at other times to touch iron, or wear garments of any color but white, yet appeared clad in purple, and, taking a water pot out of the city chamber, proceeded through the middle of the town, with a sword in his hand, towards the sepulchres. There he drew water from a neighbouring spring, and washed and anointed the monuments, after which he sacrificed a bull upon a pile of wood, invoking Jupiter and infernal Mercury, and inviting to the entertainment the souls of those happy heroes who had perished in the defence of their country. After this he filled a bowl with wine, saying, I drink to those who lost their lives in the defence of the liberties of Greece. There was also a festival of the same name observed by the Samians in honor of the god of love. Slaves also, when they obtained their liberty, kept a holiday, which they called eleutheria.

ELF, *n. s.* & *v. a.*
ELF'IN, *n. s.* & *adj.*
ELF'ISH, *adj.*
ELF'-LOCK, *n. s.*
ELF'-QUEEN,
EL'VISH, *adj.*

Sax. ælfe; Goth. and Teut. *alf*; Swed. *alf-war*; Brit. *eilf*; Belg. *alve*; à Gr. επιαλτης or εφίαλτης, says Minsheu, incubus, the night-mare. Skinner derives the Saxon word from ahleopan, Saxon, to leap. The male of a fairy; a spirit of the woods or mountains; a demon; a dwarf. To elf is to entangle or ravel the hair as elves were supposed to do; and elf-locks are hair so ravelled. Elfin is a diminutive of elf; or, as an adjective, synonymous with elfish, and signifies of or belonging to elves.

In olde dayes of the King Artour,
Of which that Bretons spoken gret honour
All was this lond fulfilled of Faerie;
The *Elf*-quene with hire joly compagni
Danced ful oft in many a grene mede.
*Chaucer. Cant. Tales.*

Now when that idle dream was to him brought,
Unto that *elfin* knight he bade him fly,
Where he slept soundly. *Spenser.*

Through this house give glimmering light,
By the dead and drowsy fire;
Every *elf*, and fairy sprite,
Hop as light as bird from briar. *Shakspeare.*

My face I'll grime with filth,
Blanket my loins, *elf* all my hair in knots. *Id.*

Thou *elvish* markt, abortive, rioting hog!
The slave of nature, and the son of hell! *Id.*

This is that very Mab,
That plats the manes of horses in the night,
And cakes the *elf-locks* in foul sluttish hairs,
Which, once untangled, much misfortune bodes.
*Id.*

No muse hath been so bold,
Or of the latter or the old,
Those *elvish* secrets to unfold,
Which lie from others reading.
*Drayton.*

Fairy *elves*,
Whose midnight revels by some forest side,
Or fountain, some belated peasant sees
Or dreams he sees. *Milton.*

From the like might proceed the fears of polling *elvelocks*, or complicated hairs of the head.
*Browne's Vulgar Errours.*

The king of *elfs* and little fairy queen
Gamboled on heaths, and danced on every green.
*Dryden.*

That we may angels seem, we paint them *elves*;
And are but satires to set up ourselves. *Id.*

However it was civil, an angel or *elf*;
For he ne'er could have filled it so well of himself
*Swift.*

Ye sylphs and sylphids to your chief give ear;
Fays, fairies, genii, *elves*, and demons hear. *Pope.*

Drawn by conceit from reason's plan,
How vain is that poor creature, man!
How pleased is every paltry *elf*
To prate about that thing himself. *Churchill.*

How from the yielding touch and rolling eyes
The piles immense of human science rise.—

With mind gigantic steps the puny *Elf*,
And weighs and measures all things but himself.
*Darwin.*

Here, seen of old, the elfin race
With sprightly vigils marked the place;
Their gay processions charmed the sight,
Gilding the lucid noon of night. *Id.*

Elf Arrows, in natural history, a name given to the flints anciently fashioned into arrow-heads, and still found fossile in Scotland, America, and several other parts of the world: they were believed to be shot by fairies, and that cattle were sometimes killed by them.

ELGIN or Elgyn, a royal borough of Scotland, and formerly a bishop's see, is situated on the river Lossie, about six miles north of the Spey. The name is probably derived from Helgy, general of the army of Sigurd, the Norwegian earl of Orkney, who, about 927, conquered Caithness, Sutherland, Ross, and Moray. It is said that he built a town in the south of Moray, which it is probable was Elgin. Many Norwegian princes were also named Helgy, and the inscription upon the town seal is, 'S. commune civitatis de Helgyn,' engraved in Saxon characters, in a style earlier than the middle of the sixteenth century. In the reign of William the Lion, Elgin had a royal fort. Its most ancient charter in the archives is from Alexander II. in 1234, granting a guild to the burgesses with extensive privileges. Elgin is a good town, and has many of the houses built over piazzas; but, excepting its great cattle fairs, has little trade. It is principally remarkable for its ecclesiastical antiquities. The cathedral, now in ruins, has been formerly a very magnificent pile. The west door is richly ornamented. The choir is very beautiful, and has a fine light gallery running round it. At the east end are two rows of narrow windows, in an excellent Gothic taste. The chapter house is an octagon; the roof supported by a fine single column with neat carvings of coats of arms round the capital. There is still a tower on each side of this cathedral; but that in the centre, with the spire and whole roof, are fallen in; and form awful fragments, mixed with the battered monuments of knights and prelates. The cathedral was founded by Andrew de Moray, in 1224, on a piece of land granted by Alexander II.; and his remains were deposited in the choir, under a tomb of blue marble, in 1244. The great tower was built principally by John Innes, bishop of this see, as appears by the Latin inscription cut on one of the great pillars. At the west end of the town are to be seen the ruins of an ancient castle, in which Edward Bruce surprised an English garrison early in the fourteenth century. Elgin is a royal borough, and unites with Banff, Cullen, Inverary, and Kintore, in returning a member to parliament. The burgesses resident in the town are alone eligible to the magistracy. Sixty-three miles and a half north-west from Aberdeen, and 144 north from Edinburgh. Population between 3000 and 4000. The parish of Elgin is about ten miles in length and six in breadth. Population of the town and parish, 4602.

Elgin Marbles. These admirable works of ancient art, recently purchased by the public of the earl of Elgin, are derived chiefly from the temple of Minerva, in the Acropolis at Athens, originally known as the Hecatompedon, or of an hundred feet, on account of its breadth; and Parthenon, or Temple of the Virgin, from the character of its patroness. This edifice was erected under the administration of Pericles, by Phidias, and artists and architects employed under him, about B.C. 500. It was wholly built of white marble, and the plan was that which is technically called octastyle peripteral; that is to say, it was an oblong colonnade, having eight columns in the porticos, front and back, and fifteen down each side, exclusive of those at the angles; within the columns, at about the distance of nine feet, was the wall of the cella, or interior of the temple; and this cella was a peristyle, that is, it had a row of columns forming an internal colonnade; this colonnade in the Parthenon seems to have supported a gallery.

The interior was divided into two parts: that towards the east, or front, was the place of worship, and occupied about two-thirds of the length—here stood the statue of the goddess; the division to the west was called the opisthodomos, and it was here that the public treasures were kept.

The pediments or triangular spaces over the portico, were adorned with groups of statues. Pausanias says, 'the pediment of the front, or entrance, represented the birth of Minerva; and that of the back the Contest of Minerva and Neptune for Attica.' Att. c. 24. The Acropolis is entered from the westward, and, of course, the west end of the temple is that which first presents itself to the observer; and the east end was, at the earliest modern period when we have any record of it, shut in and built round with Turkish houses: from these two circumstances it has happened that travellers mistook the west for the front, and the east for the back, and they, therefore, erroneously applied what Pausanias had said of the one to the other, and, having once fallen into this error, they went on, moulding, by their own ingenious fancies, the remains of the groups of the several pediments into some kind of consistency with his relation.

So obstinately long-lived was this error, that though the ingenious and accurate Stuart, in the second volume of his beautiful and valuable Survey of Athens, establishes, beyond all doubt, that the principal front and entrance were to the eastward (as indeed was the case in all ancient temples), yet, from not consulting the original Greek, he adopts, as to the subject of the sculptures of the pediments, the common error, and argues as if Pausanias had said the west instead of the entrance, which is his real expression. This point has been, of late, fully explained and decided by the work of the Chevalier Visconti on the Elgin marbles, London, 1816.

The height of the statues in the pediments varied in size, according to the increasing height of the cornice under which they were placed, from about seven feet to twelve; but as the pediment at each angle came, of course, to a point, erect figures of even the lowest stature could not be introduced; but the artist overcame this

difficulty with admirable skill, for the statues nearest the angles were recumbent, with their feet towards the angles; next came sitting figures, then figures in higher attitudes, and lastly, towards the centre, the chief figures of the composition upright and at full length. The next portion of the temple which we are to examine is the entablature, which surmounted the entire colonnade. The frieze of this entablature was composed of the well known Doric architectural ornaments called triglyphs, and of sculptured ornaments called metopes, placed alternately, the triglyph being over the centres of each column and of each intercolumniation, and the metopes occupying the intervals; each of these metopes consisted of a block of marble about three feet square, representing in bold *high-relief* the combat of a Lapitha with a Centaur. This subject was, on account of Theseus, who had overcome the Centaurs, one of national interest with the Athenians, and it seems to have been a very favorite subject in all sculptures of this period. It was depicted, as Pliny tells us, on the sandals of Minerva in the temple; it ornamented, as we still see, the frieze of the temple of Theseus, and it was again introduced in the frieze of the temple of Phigalia, which was built by Ictinus, one of the architects employed under Phidias on the Parthenon.

Another part of the Parthenon to which we must direct the attention of our readers is the frieze of the cella, or interior; this was an uninterrupted series of sculpture in blocks of marble about three feet high, that ran round the upper part of the wall, which, as we before stated, was about nine feet within the external row of columns; this frieze, with peculiar taste and judgment, represented, in very *low-relief*, the Panathenaic Procession, the highest festival of the Athenians, the solemnity in which the whole people conveyed, in solemn pomp, to this very temple, the sacred veil that was to be suspended over the statue of the goddess within.

These are the three classes of sculptures which adorned the exterior of the temple, and have alone come down to posterity; and it may not be here improper, though it is somewhat premature, to observe that the *perfect statue* of the pediment, the *high-relief* of the metope, and the *low-relief* of the frieze, include the only three species of which the art of sculpture is capable. In the pediments, which not only admitted, but required, on account of the situation as well as of the subjects, the boldest and noblest efforts of his art, Phidias represented divinities and heroes in full wrought statues of the colossal size, grouped with all the variety of attitude, expression, and sentiment. In the metopes, which, from their situation between the triglyphs, and their distance from the eye, ran the risk of being indistinct, he employed the highest relief of which there is any instance extant; in fact these groups are almost statues, and adhere to the blocks of marble by a very slight contact: but in the wall of the cell, which was surrounded by the ambulatory, this high-relief would have had two ill effects—it would have jetted out unpleasantly over the heads of the spectators, and prevented their having a perfect view of its composition, and as the only light by which it could be seen was reflected, broken, and unequal, (being admitted through the intercolumniations), the violent shadows of a high-relief would have perplexed and defeated the artist's design; for this situation, therefore, he employed relief so very low, that though it is the most exquisite and striking work of the ancient chisel, and though it expresses action, light, and shade in the highest perfection, it does not, in any part, project above an inch, and, in truth, exhibits all the force of relief with all the smoothness and delicacy of a drawing.

These details will at once prepare our readers to see how this great artist joined to the most fertile fancy, the truest taste, and the most perfect architectural science; and to understand the important acquisitions to our English school of sculpture, which the following list of the Elgin marbles presents.

We now, therefore, insert an abstract of the official catalogue, drawn up from the notes of the learned Visconti, of all the articles of the Elgin collection; and afterwards insert various testimonies to their value both as antiques and as works of art.

From the Parthenon there are ninety-two pieces, of which six statues or fragments of statues are stated to be from the eastern pediment, five from the western pediment, and six, the places of which (Report 71) are not ascertained. Of the metopes in high-relief there are fourteen. Of the frieze of the cell, in low-relief, there are, in all, fifty-two pieces, viz. twelve from the east end, fourteen from the north side, one from the west, fourteen from the east, and ten whose places are not ascertained.

Lord Elgin has also obtained a variety of other articles of considerable curiosity and value, which are stated in the same document, and are included in his lordship's offer to the public, viz. From the Temple of Victory there are four pieces of high-relief.—From the triple Temple of Erectheus, Minerva Polias, and Pandrosa, eighteen architectural specimens.—Seven architectural Doric specimens from the Propylea, Parthenon, &c.—Three pieces from the theatre of Bacchus.—Thirteen detached heads or fragments of heads.—Thirty-five detached pieces of various sculpture.—Eleven marble and three bronze urns; and some hundreds of vases, dug up in or near Athens. One of the bronze urns was found in what is called the tomb of Aspasia.—Eight altars.—Thirteen sepulchral pillars or cippi.—Forty-four casts in plaster of Paris of the friezes of the Parthenon, the temple of Theseus, and the Choraic monument of Lysicrates.

In a collection so extensive, there must be a great variety in the worth and beauty of the articles; though there is scarcely one that is not in a high degree curious and interesting: but it is to the sculptures of the Parthenon that the collection owes its chief reputation and most transcendant value. Before the splendor of their beauty every thing else fades away, and, compared with them, this crowd of minor antiquities appears almost worthless. But, at the head of all, in excellence, the best judges have placed two statues, one of which occupied the left corner of the eastern, and the other the same place

in the western pediment.' The situation in which these statues were placed in the original composition, would not have led us to imagine that they had been the peculiar objects of the artist's care, and yet they certainly excel, not only all that has been found in the same temple, but, in the best opinions, all the statues in the world. The humble situation, if we may use the expression, which they occupied in the pediment, is probably the cause of their present superiority; they were more sheltered from the injuries of time or accident, and, although much mutilated and weather-worn, they exhibit such a degree of excellence as leaves us at a loss to conceive any higher degree of merit, or to imagine how the rest of the composition could be kept on a scale of excellence answerable to these subordinate parts. But our readers will be glad to hear what our superior artists and connoisseurs say of these admirable sculptures.

We follow the House of Commons' Report of their testimony:—Mr. Nollekens rates these marbles in the same class with the finest sculptures of Italy, and beyond any thing that this country before possessed; and he adds, that the Theseus is, in his opinion, equal to the Apollo Belvedere.—*Report*, p. 30.

Mr. Flaxman considers the Elgin marbles as the finest works of art which he has seen; and he especially places the Theseus in the first order of merit: but, when the Theseus is compared with the Apollo Belvedere, Mr. Flaxman would prefer the latter, because the Theseus is a mere representation of nature, fine nature indeed, but mere nature; and the Apollo is a higher effort of the art, namely, an attempt at the perfection of ideal beauty.—*Report*, p 30.

Mr. Westmacott considers the whole collection as of the first class of art, but the Theseus and Ilissus he thinks unequalled—they are infinitely superior to the Apollo Belvedere, because they unite the greatest dignity of style with the greatest truth of nature, and that the Apollo is merely an ideal figure. He cannot readily determine which he prefers, the Theseus or the Ilissus: the back of the Theseus is the finest thing in the world, and the front of the Ilissus is not surpassed by any known work of art.—*Report*, p. 33.

On this very just observation of Mr. Westmacott's it is worth remarking, that the parts of each statue which he thus distinguishes, are those in which the surface happens to be most perfect, and in which of course the hand of the original master is more distinctly visible.

Mr. Chauntry, though he does not state distinctly that he prefers these statues to the Apollo, seems to consider them as higher specimens of the art. The characters of the works, he truly observes, are not comparable; the Elgin statues are groups in the simplest and grandest style of nature. The Apollo is a single figure, wrought out with a degree of finish that would have been mischievous in the former. At the same time Mr. Chauntry remarks, that though these statues have all this grand simplicity of nature, and are calculated to produce the greatest effect in the distant position for which they were intended, they are yet executed with a degree of finish which is quite surprising, and which yet detracted nothing from the magnificence of their local effect.—*Report*, p. 37.

Mr. Rossi considers the Theseus and Ilissus as superior to the Apollo and Laöcoon, and he adds the important verbal testimony of Canova, with whom he had personally visited the marbles, 'that they were as fine things as he had ever seen.'—*Report*, p. 37.

Mr. Wilkins, a gentleman of taste and learning, and of well-merited eminence in his own profession as an architect, ranks the Elgin marbles 'in the very highest order of art.'—*Report*, p. 43.

Not less decisive was the opinion of Mr. West, the late president of the Royal Academy, and Sir Thomas Lawrence, without whose opinion the Committee appear (very properly) to have thought their Report would not be satisfactory to the public.

The president considered the Theseus and Ilissus, the Torso of Neptune, and the Horse's Head, as in the first class of dignified art employed on the finest specimens of nature. The Apollo and Torso of the Belvedere, and the Laöcoon, as specimens of systematic art—the production of ideal form by mechanical principles.—Report, p. 59. And he states, both in his evidence, and in a letter subjoined to the Pursuits, with a modesty and force which do equal honor to himself and these marbles, that he has worked from them, as a student, for his own improvement.—Pursuits, p. 52. That he has patiently drawn the most distinguished of them, the same size of the marbles; that he has introduced their spirit and forms, as far as he was capable of catching them, into his own compositions; and he adds:—

'Had I been blessed with seeing and studying these emanations of genius at an earlier period of life, the sentiment of their pre-eminence would have animated all my exertions; and more character, and expression, and life, would have pervaded all my humble attempts in historical painting.'—*Pursuits*, pp. 54, 55.

We cannot refuse ourselves the pleasure of extracting another passage of his letter, in which this amiable old man poured forth his gratitude for the benefit which lord Elgin has conferred on the arts of his country.

'In whatever estimation the arts of the present day shall be held by those of future ages, your lordship must be remembered by the present, and be recorded by those to come, as a benefactor, who has conferred obligations, not only on a profession, but upon a nation; and as having rescued from the devastation of ignorance, and the unholy rapine of barbarism, those unrivalled works of genius, to be preserved in the bosom of your country, which a few centuries more might have consigned to oblivion.'—*Pursuits*, p. 52.

The opinion of Sir Thomas Lawrence is marked by that fine genius and taste which those who know him find in his conversation, and which all admire in the efforts of his pencil.

He considers the Elgin marbles as in the very highest class of art; and after having made himself minutely acquainted with the chefs-

d'œuvre in the gallery of the Louvre, he pronounces the Elgin statues to be of a higher class than the Apollo; because, as he judiciously marks the distinction, there is in them a union of fine composition and grandeur of form, with a more true and perfect expression of nature, than there is in the Apollo, or in any other of the most celebrated statues;—there is in them all that beautiful and harmonious variety which is produced in the human form by the alternate repose and action of the muscles; and it is impossible, he adds, after looking at the Elgin statues, to look at the casts of other celebrated works, without being struck by the inferiority of the latter in this respect.

The earl of Aberdeen, in his evidence, which is of considerable length, and which does the greatest credit to his candor, learning, and good taste, rates them in the highest class of art.

And finally, Canova, the most celebrated sculptor of modern times, in addition to his verbal expressions of admiration, left, in a letter to lord Elgin, his recorded judgment of them.

London, Nov. 10, 1815.

'Permit me to express the sense of the great gratification which I have received from having seen in London the valuable antique marbles, which you have brought hither from Greece. I think that I can never see them often enough: and, although my stay in this great capital must be extremely short, I dedicate every moment that I can spare to the contemplation of these celebrated remains of ancient art. I admire in them the truth of nature united to the choice of the finest forms. Every thing here breathes life, with a veracity, with an exquisite knowledge of art, but, without the least ostentation or parade of it, which is concealed by consummate and masterly skill. The naked is perfect flesh, and most beautiful in its kind. I think myself happy in having been able to see with my own eyes these distinguished works; and I should feel perfectly satisfied if I had come to London only to view them. Upon which account the admirers of art, and the artists, will owe to your lordship a lasting debt of gratitude, for having brought amongst us these noble and magnificent pieces of sculpture; and for my own part I beg leave to return you my own most cordial acknowledgments.'

'Nothing, perhaps, after all,' however, says the Quarterly Reviewer, 'will surprise the common observer more than the extraordinary praises which are lavished upon what appear to them to be little better than mutilated and shapeless fragments—to their eyes in no degree ornamental, and to their judgments of no kind of utility. It must be confessed that the details of those sculptures have been greatly and lamentably degraded; but there remains enough amply to gratify the eye of taste, and to guide and form the powers of the student. It should be recollected, in considering this point of the subject, that not one of the great statues of the ancient world was found in a perfect state. The Venus de Medicis is in, we know not how many, pieces, and both the arms, at least, are modern—of the Apollo, the most perfect of ancient sculptures, one hand and one arm are modern, and both the legs were broken. Of the beautiful Ceres, one of the most exquisite remains of antiquity, the head, though undoubtedly antique, does not belong to the body. The Torso, every one knows, is a mere trunk, without limbs or head. The Barberini Faun, which we have heard called the most perfect statue in the world, wants the legs and hands. The Laöcoon has been restored; and, in short, all those admirable specimens of the arts, when first found, would have excited to the common observer the same disappointment, though in various degrees, which the Elgin marbles have excited in some ordinary visitors; but it is with them as with the cartoons and frescos of Raphael, if disappointment clouds the first visit, it vanishes at the second; and, by a more constant examination of those divine models, a purity of taste and accuracy of judgment grows up in the mind of the student, till at last, not his fancy, but his judgment, supplies the deficiencies, and repairs the damages of accident and time.

'Who is there, however unskilled in the arts, who can, for any time, look on the representation of the Panathenaic procession without the highest intellectual delight, that festival of the metropolis of the civilised world, connected with all the delicious remembrances of Athenian history, designed by the hand of Phidias, from the living procession in which Pericles, and Socrates, and Aspasia walked, and exhibiting on the marble which we may now call eternal, the noblest moral recollections with the most exquisite forms of natural beauty;—who is there, we say, who can look at this admirable work without feeling that expansion of the heart, that exaltation of the mind, which it is the first and proudest office of the fine arts to create.'

These marbles were finally secured to the public for the sum of £35,600, we believe, and are deposited in the British Museum. Many foreigners are said to have already come into this country, solely for the purpose of seeing them; and casts from the whole collection have been sent to Bavaria, to Wirtemberg, to Russia: others have been ordered for Florence. 'The school of sculpture,' adds the critic we have before quoted, 'will soon be in England.'

ELI, Heb. עלי, i. e. offering, high priest of Israel, and the last of the judges except Samuel, succeeded Samson, about A. M. 2848; and A.A.C. 1156. His too gentle government, particularly towards his sons, the practisers of the greatest wickedness, and the consequent misfortunes of his family and the commonwealth, are recorded in 1 Sam. iv. xiv. and xxii. He died in the fortieth year of his government, and ninety-eighth of his age, A. M. 2888, and A. A. C. 1116.

ELIAS, or ELIJAH, from אל, God, and יה, the Lord, an eminent prophet of Israel, who escaped the common lot of mankind, by not suffering death; being translated, about A. M. 3108, and A. A. C. 896. His miracles, persecutions, and ascension to heaven, are recorded in 1 Kings xvii—xxi.; 2 Kings i. and ii.

ELICHMAN (John), a native of Silesia in the seventeenth century, who practised physic

at Leyden, and was remarkable for his knowledge of sixteen languages. He supported an opinion, that the German and Persian languages were derived from the same origin. His Latin translation of the Tablet of Cebes, with the Arabic version and the Greek, was printed at Leyden in 1640, under the care of Salmasius, who prefixed thereto a very ample preface.

ELICHPOOR, a town and district of the province of Berar, Hindostan. It belongs to the nizam, and lies between the twentieth and twenty-second degrees of northern latitude: it is separated from the territories of the Berar rajah by the river Burda. The capital was formerly the chief town of all Berar, and is said to have been founded in very ancient times, by rajah Elloo; it stands on a branch of the Burda, and is a fortified place. In 1772 it was besieged by the Mahrattas, who retired upon payment of the tribute: it was then governed by a deputy of the nizam, who bore the title of nabob, and in the year 1777 endeavoured to establish his independence; but he was soon surrounded by the troops of the former, and was killed in battle. His family being made prisoners, all his property was confiscated. It is still governed by a deputy, who has charge of the district.

ELIC'IT, *v. a.* & *adj.* }
ELIC'ITATE, *v. a.* }
ELICITA'TION, *n. s.* } Lat. *elicio, elicitum*, to draw out. To strike or bring out by labor or art. The verbs are synonymous: as an adjective elicit means brought into action, or actual existence.

It is the virtue of humility and obedience, and not the formal *elicit* act of meekness; meekness being ordinarily annexed to these virtues. *Hammond.*

The schools dispute whether, in morals, the external action superadds any thing of good or evil to the internal *elicit* act of the will. *South.*

That *elicitation* which the schools intend, is a deducing of the power of the will into act: that drawing which they mention, is merely from the appetibility of the object. *Bramhall.*

Although the same truths may be *elicited*, and explicated by the contemplation of animals, yet they are more clearly evidenced in the contemplation of man. *Hale's Origin of Mankind.*

He *elicits* those acts out of the meer lapsed state of human nature. *Cheyne.*

ELIDE', *v. a.* }
ELI'SION, *n. s.* } Fr. *elider*; Lat. *elido, elisus*; to strike off; to break off or from: hence to break in pieces.

We are to cut off that whereunto they, from whom these objections proceed, fly for defence, when the force and strength of the argument is *elided*. *Hooker.*

The cause given of sound, that it would be an *elision* of the air, whereby, if they mean any thing, they mean a cutting or dividing, or else an attenuating of the air, is but a term of ignorance. *Bacon's Natural History.*

You will observe the abbreviation and *elisions*, by which consonants of most obdurate sounds are joined together, without any softening vowel to intervene. *Swift.*

EL'IGIBLE, *adj.* }
ELIGIBIL'ITY, *n. s.* } Lat. *eligibilis, eligo*, to choose. Fit to be chosen; preferable. Eligibility is worthiness, or legal fitness to be chosen.

Certainty, in a deep distress, is more *eligible* than suspense. *Clarissa.*

The business of the will is not to judge concerning the nature of things, but to choose them in consequence of the report made by the understanding, as to their *eligibility* or goodness. *Fiddes's Sermons.*

A British ministry ought to be satisfied, if, allowing to every particular man that his private scheme is wisest, they can persuade him, that next to his own plan, that of the government is the most *eligible*. *Addison's Freeholder.*

Did they really think, that going on with the war was more *eligible* for their country than the least abatement of those conditions? *Swift.*

Through tomes of fable and of dream,
I sought an *eligible* theme;
But none I found, or found them shared
Already by some happier bard. *Cowper.*

ELIHU, from Heb. אלי and הוא, i. e. he is my God, the son of Barachel the Buzite, a descendant of Buz, the son of Nahor, Abraham's brother, and the youngest of Job's friends who visited him in his affliction. His remarkable speech to Job, and his senior friends, is recorded in the thirty-second and five following chapters. From some passages in that speech, particularly in chap. xxxiii. ver. 4 and 6, as well as from the propriety of the sentiments expressed in it, and the signification of the name Elihu, and more especially from the Almighty himself being introduced as the next speaker, some commentators have supposed, that our Saviour is meant by this personage. Others have supposed that Elihu was the author of the book of Job, from the fifteenth and sixteenth verses of chap. xxxii. where he seems to speak of himself as the writer of the narrative, and of the effect of his words upon Job's three senior friends. But these two verses are indeed evidently a parenthesis, and cannot, by any construction of language, be reckoned a part of the speech, which precedes and follows them.

ELIM'INATE, *v. a.* }
ELIMINA'TION, *n. s.* } Fr. *eliminer*; Lat. *elimino*, from *e* and *limen*, the threshold of a door; to put beyond the door; to banish: hence to set free; liberate.

*Eliminate* my Spirit, give it range
Through provinces of thought yet unexplored,
Teach me by this stupendous scaffolding,
Creation's golden steps, to climb to Thee.
*Young.*

ELIOTT, or ELLIOT (George Augustus), Lord Heathfield, was the youngest son of Sir Gilbert Eliott, Bart. of Stobbs, in Roxburghshire, where lord Heathfield was born in 1718. He received the first rudiments of his education under a private tutor; and was early sent to the university of Leyden. Being designed for a military life, he was sent from thence to the celebrated Ecole Royale du Genie Militaire, conducted by the great Vauban, at La Fere, in Picardy, where he laid the foundation of what he so conspicuously exhibited at the defence of Gibraltar. He returned to Scotland in 1735, in the seventeenth year of his age, and was introduced by his father to lieutenant-colonel Peers, of the twenty-third regiment of foot, then lying at Edinburgh. He was accordingly entered as a volunteer in that regiment, where he continued for a year or more: he then went into the engineer corps at

Woolwich, where he continued till 1740, when his uncle Colonel Eliott appointed him his adjutant of the second troop of horse grenadiers. With these troops he went upon service to Germany, and was with them in a variety of actions. In this regiment he bought the rank of captain and major, and afterwards purchased the lieutenant-colonelcy from Colonel Brewerton, who succeeded to his uncle. Soon after this he was appointed aid-de-camp to George II., and was distinguished for his military skill and discipline. In March 1759 he quitted the second troop of horse grenadier guards, being selected to raise, form, and discipline, the first regiment of light horse, called after him Eliott's regiment. As soon as they were raised and formed, he was appointed to the command of the cavalry in the expedition on the coasts of France, with the rank of brigadier general. After this he passed into Germany, where he was employed on the staff, and greatly distinguished himself in a variety of movements; particularly at the battle of Minden, where he headed the second line of horse under the marquis of Granby; and where his regiment displayed a strictness of discipline, an activity and enterprise, which gained them signal honor. From Germany he was recalled in 1762, for the purpose of being employed as second in command in the memorable expedition against the Havannah. On the peace in 1763 his regiment was reviewed by the king, when they presented to his majesty the standards which they had taken from the enemy. Gratified with their fine discipline and high character, the king appointed it a royal regiment, naming it the 15th, or King's Royal Regiment of Light Dragoons. In 1774 he was appointed to succeed general A'Court as commander in chief of the forces in Ireland; but he soon solicited to be recalled. He accordingly was so, and appointed to the command of Gibraltar in a fortunate hour for the safety of that important fortress. His gallant defence of this besieged rock is too well known to every Englishman, and too intimately connected with English history, to need a separate description here. See England, History of. On his return to England, the gratitude of the British senate was as forward as the public voice in giving him that distinguished mark his merit deserved. Both houses of parliament voted a unanimous address of thanks to the general. The king conferred on him the honor of Knight of the Bath, with a pension during his own and a second life of his own appointment; and on June 14th, 1787, his majesty advanced him to the peerage by the title of Lord Heathfield, Baron Gibraltar, permitting him to take, in addition to his family arms, the arms of the fortress he had so bravely defended, to perpetuate to futurity his noble conduct. He died at his chateau at Aix-la-Chapelle, on the 6th of July, 1790, in the seventy-third year of his age, of a second stroke of the palsy; after having for some weeks preceding enjoyed a tolerably good share of health, and an unusual flow of spirits. His remains were brought to England, and buried at Heathfield in Sussex, where a monument is erected to his memory.

ELIPHAZ; from אל, and פיז, i. e. the strength of God; the eldest of Job's three uncharitable friends. From his being styled the Temanite, it is evident that he was a descendant of Esau, by Teman, the son of Eliphaz, and grandson of Esau, the first duke of Edom.

ELIQUATION, in chemistry, an operation by which a more fusible substance is separated from one that is less so, by means of a heat sufficiently intense to melt the former, but not the latter. Thus an alloy of copper and lead may be separated by a heat capable of melting the latter, but not the former.

ELIS, or Elea, in ancient geography, a fertile district of Peloponnesus, famous for raising flax, which equalled that of Judea in fineness, though not so yellow, and grew no where else in Greece.

Elis, the capital of the above district, situated on the Peneus, which ran through it. It was the country of Phædo the friend of Plato, and of Pyrrho the founder of the Pyrrhonists. This city owed its origin to a union of small towns after the Persian war. It was not encompassed immediately with a wall; for it had the care of the temple at Olympia, and its territory was solemnly consecrated to Jupiter. To invade or not protect it was deemed impiety; and armies, if marching through it, delivered up their weapons, which, on their quitting it, were restored. Amidst warring states this city enjoyed repose, was resorted to by strangers, and flourished. It was a school for Olympia, which was distant thirty-seven miles. The athletic exercises were performed there, before the more solemn trial, in a gymnasium, by which the Peneus ran. There also was the town-hall, in which extemporary harangues were spoken and compositions recited. It was hung round with bucklers for ornaments. A way led from it to the baths through the Secret of Silence; and another to the market-place, which was planned with streets between porticoes of the Doric order adorned with altars and images. Among the temples one had a circular peristyle or colonnade; but the image had been removed and the roof was fallen in the time of Pausanias. The theatre was ancient, as was also a temple of Bacchus, one of the deities principally adored at Elis. Minerva had a temple in the citadel, with an image of ivory and gold made by Phidias. At the gate leading to Olympia was the monument of a person, who was buried, as an oracle had commanded, neither within nor without the city. The structures of Elis, Dr. Chandler observes, seem to have been raised with materials far less elegant and durable than the produce of the Ionian and Attic quarries. The ruins are of brick, and not considerable, consisting of pieces of ordinary walls, and an octagon building with niches, which, it is supposed, was the temple with a circular peristyle. These stand detached from each other, ranging in a vale southward from the wide bed of the river Peneus; which, by the margin, has several large stones, perhaps reliques of the gymnasium. The citadel was on a hill, which has on the top some remnants of a wall.

ELISHA, or Elisæus; from Heb. אל and ישע, i. e. the salvation of God; the son of Sha-

phat, an eminent prophet of Israel, the disciple and successor of Elijah. His call, with his various miracles and prophecies, are recorded in 1 Kings, xix. xxi.; 2 Kings, ii.—viii. and xiii. He died much lamented by Joash king of Israel, A. M. 3165, and A. A. C. 839.

ELISHAH, the son of Javan, and grandson of Japhet, is supposed by chronologists to have been the progenitor of the inhabitants of Eolia, in Lesser Asia, and of Elis and Alisium in Peloponnesus.

ELI'SION. See ELIDE.

ELIX'ATE, *v. a.* } Lat. *elixare*, to boil: but ELIXA'TION, *n. s.* } all etymologists derive ELIX'IR. } *elixir*, so written in Fr. Ital. Span. Port. and Lat. from the Arabic; Mr. Thomson says, from the Arab. *al uxseer*. Elixation is the act or state of boiling. Elixir is a supposed quintessence, 'or the philosopher's stone, or one of the names thereof. Some take it for the chemical powder of production,' says Minsheu. 'The word signifieth force or strength,' he adds. It is used for any cordial.

> No chymist yet the *elixir* got,
> But glorifies his pregnant pot,
> If by the way to him befal
> Some odoriferous thing, or medicinal.
> *Donne.*

> What wonder then, if fields and regions here
> Breathe forth *elixir* pure! *Milton's Paradise Lost.*

> ——— Bring Quintessence of *elixer* pale,
> Out of sublimed spirits minerall.
> *Bp. Hall. Satires.*

Even to ourselves, and more perfect animals, water performs no substantial nutrition; serving for refrigeration, dilution of solid aliments, and its *elixation* in the stomach. *Browne.*

In the soul, when the supreme faculties move regularly, the inferior passions and affections following, there arises a serenity infinitely beyond the highest quintessence and *elixir* of worldly delight. *South.*

> For when no healing art prevailed,
> When cordials and *elixirs* failed,
> On your pale cheek he dropped the shower,
> Revived you like a dying flower. *Waller.*

When we see men grow old, and die at a certain time one after another, from century to century, we laugh at the *elixir* that promises to prolong life to a thousand years. *Dr. Johnson.*

ELIXIR, in medicine, is defined by others, a compound tincture extracted from many efficacious ingredients. The difference between a tincture and an elixir seems to be this, that a tincture is drawn from one ingredient, sometimes with an addition of another to open it and to dispose it to yield to the menstruum; whereas an elixir is a tincture extracted from several ingredients at the same time.

ELIZABETH, queen of England, daughter of Henry VIII. and Anne Boleyn, was born at Greenwich, September 7th, 1533. She was early instructed in the learned languages, first by Grindal, and afterwards by the celebrated Roger Ascham. She acquired likewise considerable knowledge of the Italian, Spanish, and French, languages. Dr. Grindal was also her preceptor in divinity, which she is said to have studied with uncommon application and industry. That Elizabeth became a Protestant, and her sister Mary a Papist, was the effect of that cause which determines the religion of the most of mankind; namely, the opinions of those by whom they are educated: and this difference of opinion, in their tutors, is not at all surprising, when we recollect, that their father was of both religions, and of neither. But the studies of Elizabeth were not confined merely to languages and theology; she was acquainted with the political history of the ancients; and was also well skilled in music. After the short reign of her brother Edward, our heroine being then about twenty years of age, and her bigoted sister acceding to the crown, Elizabeth experienced a considerable degree of persecution, so as to be even apprehensive of a violent death. She was imprisoned; and we are told inhumanly treated. At last, by the intercession of king Philip of Spain, she was set at liberty; which she continued to enjoy till, on the death of her sister, she, on the 17th of November, 1558, ascended the throne of England. Her political history as a queen, is universally known and admired. See ENGLAND. But her attention to government did not suspend her pursuit of learning. Ascham, in his Schoolmaster, tells us, that, about 1563, five years after her accession, she being then at Windsor, 'besides her perfect readiness in Latin, Italian, French, and Spanish, she read more Greek in one day than some prebendaries of that church did read Latin in a whole week.' She employed Sir John Fortescue to read to her Thucydides, Xenophon, Polybius, Euripides, Æschines, and Sophocles.—Ballard, p. 219. That the Latin language was familiar to her, is evident from her speech to the university of Oxford, when she was near sixty; as well as from her spirited answer to the Polish ambassador in 1598. 'But,' says Walpole, 'a greater instance of her genius, and that too in Latin, was her extempore reply to an insolent prohibition delivered to her from Philip II. by his ambassador, in this tetrastic.

> Te veto ne pergas bello defendere Belgas:
> Quæ Dracus eripuit, nunc restituantur oportet:
> Quas pater evertit, jubeo te condere cellas:
> Religio papæ fac restituatur ad unguem.

'She instantly answered him, with as much spirit as she used to return his invasions,'

> Ad Græcas, bone rex, fient mandata kalendas.

Being pressed by a Romish priest, during her persecution, to declare her opinion concerning the real presence of Christ's body in the wafer, she answered, it is said,

> Christ was the Word that spake it;
> He took the bread and brake it;
> And what that Word did make it,
> That I believe and take it.

Sir Walter Raleigh having wrote on a window,

> Fain would I climb, yet fear I to fall;

She immediately wrote under it.

> If thy heart fail thee climb not at all.
> *Worthies of Devonshire,* 261.

Elizabeth was doubtless a woman of singular capacity and extraordinary acquirements; and, if we could forget the fate of her cousin, queen Mary, and of her own favorite, Essex, together with the burning of the anabaptists; in short,

could we forbear to contemplate her character through the medium of religion and morality, we might pronounce her the most illustrious of illustrious women. See England, Mary, and Scotland. She died at Richmond the 24th March, 1602, aged seventy, having reigned forty-four years, and was interred in the chapel of Henry VII. in Westminster Abbey. Her successor, James, erected a magnificent monument to her memory. She wrote, 1. The Mirrour or Glass of the Sinful Soul. This was translated out of French verse into English prose, when she was eleven years old. It was dedicated to queen Catherine Parr. Probably it was never printed; but the dedication and preface are preserved in the Sylloge epistolarum, in Hearne's edition of Livii Foro-Juliensis, p. 161. 2. Prayers and Meditations, &c.; dedicated to her father, dated at Hatfield, 1545, MS. in the royal library. 3. A Dialogue out of Xenophon, in Greek, between Hiero a king, yet some time a private person, and Simonides, a poet, as touching the life of the prince and private man; first printed from a MS. in her own hand writing, in the Gentleman's Magazine, for 1743. 4. Two Orations of Isocrates, translated into Latin. 5. Latin Oration at Cambridge, preserved in the king's library, in Hollingshed's Chronicles, p. 1206; and in Fuller's History of Cambridge, p. 138. 6. Latin Oration at Oxford; in Wood's History and Antiquities of Oxford, lib. i. p. 289; also in Dr. Jebb's Appendix to his Life of Mary, Queen of Scots. 7. A Comment on Plato. 8. Boethius de Consolatione Philosophiæ, translated into English, 1593. 9. Sallustius de Bello Jugurthino, translated into English, 1590. 10. A Play of Euripides, translated into Latin, Cat. of Royal Auth. 11. A Prayer, for the use of her fleet in the great expedition in 1596. 12. Part of Horace's Art of Poetry, translated into English, anno 1598. 13. Plutarch de curiositate, translated into English. 14. Letters on various occasions to different persons; several Speeches to her Parliament; and a number of other pieces.

Dr. Lingard, the Catholic historian, has given us a character of this princess which displays the usual research and elaborate care of his work. It is perhaps, as a whole, a fair specimen of his History of England. We subjoin the principal part of it.

'In the judgment of her contemporaries,' he says, 'and that judgment has been ratified by the consent of posterity, Elizabeth was numbered among the greatest and most fortunate of our princes. The tranquillity which, during a reign of nearly half a century, she maintained within her dominions, while the neighbouring nations were convulsed with intestine dissensions, was taken as a proof of the wisdom or the vigor of her government: and her successful resistance against the Spanish monarch, the many injuries which she inflicted on that lord of so many kingdoms, and the spirit displayed by her fleets and armies, in expeditions to France and the Netherlands, to Spain, to the West and even to the East Indies, served to give to the world an exalted notion of her military and naval power. When she came to the throne, England ranked only among the secondary kingdoms; before her death it had risen to a level with the first nations in Europe.

'Of this rise two causes may be assigned. The one, though more remote, was that spirit of commercial enterprise, which had revived in the reign of Mary, and had been carefully fostered, in that of Elizabeth, by the patronage of the sovereign, and the co-operation of the great. Its benefits were not confined to the trading and sea-faring classes, the two interests more immediately concerned. It gave a new tone to the public mind: it diffused a new energy through all ranks of men. Their views became expanded: their powers were called into action: and the example of successful adventure furnished a powerful stimulus to the talent and industry of the nation. Men in every profession looked forward to wealth and independence: all were eager to start in the race of improvement.

'The other cause may be discovered in the system of foreign policy, adopted by the ministers; a policy, indeed, which it may be difficult to reconcile with honesty and good faith, but which, in the result, proved eminently successful. The reader has seen them perpetually on the watch to sow the seeds of dissension, to foment the spirit of resistance, and to aid the efforts of rebellion, in the neighbouring nations. In Scotland the authority of the crown was almost annihilated; France was reduced to an unexampled state of anarchy, poverty, and distress: and Spain beheld with dismay her wealth continually absorbed, and her armies annually perishing, among the dikes and sand-banks of the Low Countries. The depression of these powers, if not a positive, was a relative benefit. As other princes descended, the English queen appeared to rise on the scale of reputation and power.

'In what proportion the merit or demerit of these and of other measures should be shared between Elizabeth and her counsellors, it is impossible to determine. On many subjects she could see only with their eyes, and hear with their ears; yet it is evident that her judgment or her conscience frequently disapproved of their advice. Sometimes, after a long struggle, they submitted to her wisdom or obstinacy; sometimes she was terrified or seduced into the surrender of her own opinion: generally a compromise was effected by mutual concessions. This appears to have happened on most debates of importance, and particularly with respect to the treatment of the unfortunate queen of Scots. Elizabeth may perhaps have dissembled: she may have been actuated by jealousy or hatred: but, if we condemn, we should also remember the arts and frauds of the men by whom she was surrounded, the false information which they supplied, the imaginary dangers which they created, and the despatches which they dictated in England to be forwarded to the queen through the ambassadors in foreign courts, as the result of their own judgment and observation.

'It may be, that the habitual irresolution of Elizabeth was partially owing to her discovery of such practices: but there is reason to believe that it was a weakness inherent in the constitu-

tion of her mind. To deliberate appears to have been her delight: to resolve was her torment. She would receive advice from any; from foreigners as well as natives, from the ladies of her bed-chamber no less than the lords of her council: but her distrust begot hesitation; and she always suspected that some interested motive lurked under the pretence of zeal for her service. Hence she often suffered months, sometimes years, to roll away before she came to a conclusion: and then it required the same industry and address to keep her steady to her purpose, as it had already cost to bring her to it. The ministers, in their confidential correspondence, perpetually lamented this infirmity in the queen; in public they employed all their ingenuity to screen it from notice, and to give the semblance of wisdom to that which, in their own judgment, they characterised as folly.'

He then notices her alleged parsimony, and ascribes it, principally, to the lavish expenditure incurred by her foreign policy.

'An intelligent foreigner,' he continues, 'had described Elizabeth, while she was yet a subject, as haughty and overbearing: on the throne she was careful to display that notion of her own importance, that contempt of all beneath her, and that courage in the time of danger, which were characteristic of the Tudors. She seemed to have forgotten that she ever had a mother: but was proud to remind both herself and others that she was the daughter of a powerful monarch, of Henry VIII. On occasions of ceremony she appeared in all her splendor, accompanied by the great officers of state, and with a numerous retinue of lords and ladies dressed in their most gorgeous apparel. In reading the accounts of her court, we may sometimes fancy ourselves transported into the palace of an eastern princess. When Hentzner saw her she was proceeding on a Sunday from her own apartment to the chapel. First appeared a number of gentlemen, barons, earls, and knights of the garter; then came the chancellor with the seals, between two lords carrying the sceptre and the sword. Elizabeth followed: and wherever she cast her eyes, the spectators instantly fell on their knees. She was then in her sixty-fifth year. She wore false hair of a red color, surmounted with a crown of gold. The wrinkles of age were imprinted on her face; her eyes were small, her teeth black, her nose prominent. The collar of the garter hung from her neck; and her bosom was uncovered, as became an unmarried queen. Behind her followed a long train of young ladies dressed in white; and on each side stood a line of gentlemen pensioners, with their gilt battle-axes, in splendid uniforms.'

'The traveller next proceeded to the dining room. Two gentlemen entered to lay the cloth, two to bring the queen's plate, salt, and bread. All, before they approached the table, and when they retired from it, made three genuflexions. Then came a single and a married lady, performing the same ceremonies. The first rubbed the plate with bread and salt: the second gave a morsel of meat to each of the yeomen of the guard, who brought in the different courses; and at the same time the hall echoed to the sound of twelve trumpets, and two kettle-drums. But the queen dined that day in private; and, after a short pause, her maids of honor entered in procession, and, with much reverence and solemnity, took the dishes from the table, and carried them into an inner apartment. Yet while she maintained this state in public and in the palace, while she taught the proudest of the nobility to feel the distance between them and their sovereign, she condescended to court the good will of the common people. In the country they had access to her at all times; neither their rudeness nor importunity appeared to offend her: she received their petitions with an air of pleasure, thanked them for their expressions of attachment, and sought the opportunity of entering into private conversation with individuals. Her progresses were undoubtedly undertaken for pleasure: but she made them subservient to policy, and increased her popularity by her affability and condescension to the private inhabitants of the counties in which she made her temporary abode.'

'From the elevation of the throne, we may now follow Elizabeth into the privacy of domestic life. Her natural abilities were great: she had studied under experienced masters; and her stock of literature was much more ample than that of most females of the age. Like her sister Mary, she possessed a knowledge of five languages: but Mary did not venture to converse in Italian, neither could she construe the Greek Testament, like Elizabeth. The queen is said to have excelled on the virginals, and to have understood the most difficult music. But dancing was her principal delight: and in that exercise she displayed a grace and spirit which was universally admired. She retained her partiality for it to the last: few days passed in which the young nobility of the court were not called to dance before their sovereign; and the queen herself condescended to perform her part in a galliard with the duke of Nevers, at the age of sixty-nine.'

'It is seldom that females have the boldness to become the heralds of their own charms: but Elizabeth by proclamation announced to her people, that none of the portraits, which had hitherto been taken of her person, did justice to the original: that at the request of her council she had resolved to procure an exact likeness from the pencil of some able artist: that it should soon be published for the gratification of her loving subjects: and that on this account she strictly forbad all persons whatsoever, to [illegible] or engrave any new portraits of her features [illegible] license, or to show or publish any of the old portraits, till they had been reformed according to the copy to be set forth by authority. The courtiers soon discovered how greedy their sovereign was of flattery. If they sought to please, they were careful to admire: and adulation the most fulsome and extravagant, was accepted by the queen with gratitude, and rewarded with bounty. Neither was her appetite for praise cloyed, it seemed rather to become more craving, by enjoyment. After she had passed her grand climacteric she exacted the same homage to her faded charms as had been paid to

her youth; and all who addressed her were still careful to express their admiration of her beauty in the language of oriental hyperbole.

'In her temper Elizabeth seemed to have inherited the irritability of her father. The least inattention, the slightest provocation, would throw her into a passion. At all times her discourse was sprinkled with oaths: in the sallies of her anger it abounded with imprecations and abuse. Nor did she content herself with words: not only the ladies about her person, but her courtiers and the highest officers in the state, felt the weight of her hands. She collared Hatton, she gave a blow on the ear to the earl-marshal, and she spat on Sir Matthew ———, with the foppery of whose dress she was offended.

'Elizabeth firmly believed, and zealously upheld, the principles of government established by her father, the exercise of absolute authority by the sovereign, and the duty of passive obedience in the subject. The doctrine, with which the lord keeper Bacon opened her first parliament, was indefatigably inculcated by all his successors during her reign, that, if the queen consulted the two houses, it was through choice, not through necessity, to the end that her laws might be more satisfactory to her people, not that they might derive any force from their assent. She possessed by her prerogative whatever was requisite for the government of the realm. She could, at her pleasure, suspend the operation of existing statutes, or issue proclamations which should have the force of law. In her opinion the chief use of parliaments was to vote money, to regulate the minutiæ of trade, and to legislate for individual and local interests. To the lower house she granted, indeed, freedom of debate; but it was to be a decent freedom, the liberty of 'saying aye or no;' and those who transgressed that decency were liable, we have repeatedly seen, to feel the weight of the royal displeasure.

'The historians, who celebrate the golden days of Elizabeth, have described with a glowing pencil, the happiness of the people under her sway. To them might be opposed the dismal picture of national misery, drawn by the catholic writers of the same period. But both have taken too contracted a view of the subject. Religious dissension had divided the nation into opposite parties, of almost equal numbers, the oppressors and the oppressed. This estimate of "England's Maiden Queen," though from the pen of a Catholic historian, and as such highly [illegible] to his liberality, conveys but a very [illegible] notion of the character of Elizabeth. [illegible] present day even the respect which attends [illegible] royal diadem would not for a moment have ensured the toleration of her licentious amours, and in many respects she closely resembled her royal namesake. It is evident that neither Elizabeth nor her ministers understood the benefit of civil and religious liberty. The prerogatives which she so highly prized, have long since withered away: the bloody code which she enacted against the rights of conscience, has ceased to stain the pages of the statute book: and the result has proved, that the abolition of despotism and intolerance adds no less to the stability of the throne, than to the happiness of the people.'

Elizabeth Petrowna, empress of Russia, was the second daughter of Peter the Great, and born in 1709. The testamentary disposition of this monarch was in favor of her succession to the throne, and she was urged to avail herself of the infancy of Ivan, who had been declared emperor under the regency of his father and mother, Anthony and Elizabeth of Mecklenburg. Her surgeon, Lestoff, seems to have decided her to assert her claim, by sending to her a picture, representing her on one side seated upon an imperial throne, and on the other beheaded on a scaffold. On the night of the 6th of December, 1741, she went to the quarters of the Preobashenki regiment of guards, who immediately declared her empress. A detachment accompanied her to the palace, where they arrested the regent prince and princess and the young Ivan; and by six o'clock in the morning she was proclaimed empress by a bloodless revolution. Elizabeth now became indolent and voluptuous. On her accession she made a vow never to inflict a capital punishment; and, resolving to pass her days unmarried, she nominated her nephew, Charles Peter Ulric (afterwards Peter III.) her successor. She, however, openly indulged in the most licentious amours, and her favorites, in fact, ruled her people. She is said to have had no fewer than eight natural children by them. With all this she was most scrupulously devout, and practised with great exactness all the ceremonies of her church. In 1756 Russia joined Austria and France against the king of Prussia; and the troops of the latter so hardly pressed upon him as to bring him to the brink of destruction, when the death of Elizabeth changed the entire prospect of affairs. This took place in December, 1761, in the fifty-second year of her age.

Elizabeth, in geography, a township of Pennsylvania, in Lancaster county, eighteen miles north-west by west of Lancaster, and eighty-four west by north of Philadelphia.

Elizabeth Cape, a cape on the island which forms the north-east point of the entrance into Cook's inlet. Vancouver describes this coast as composed of high land, before which lie three small islands and some rocks; the cape is itself the largest and the most western of these islands, which appear to afford a navigable channel between them and the main land, in an east and west direction; though between the cape and the middle island some low lurking rocks were discerned, which had the appearance of being connected with a cluster above the surface of the sea, lying south-east from the cape, at the distance of three or four miles; to the south-west of the middle island is another cluster of rocks, both above and beneath the water. Long. 208° 53′ E., lat. 59° 9′ N. Also a cape on the coast of Main.

Elizabeth Castle, a fortress of the island of Jersey, built on a rock in the east side of St. Aubin's Bay, which is insulated with the flowing of the tide. It is 663 paces distant from St. Heliers.

Elizabeth City, a county of Virginia, between the rivers James and York, bounded by Warwick and York counties on the west, and Chesapeake Bay on the east and north. It is

eighteen miles long, and eight broad. Point Comfort is the southern extremity of the county.

ELIZABETH ISLAND, an island in the straits of Magellan, near the shore of Patagonia. It was visited by Bougainville, who describes its coasts as high and steep. Water and wood are both scarce, and a small sort of heath is the only thing that can be used as fuel here. Long. 71° 45′ W., lat. 52° 50′ N.

ELIZABETH ISLANDS, sixteen small islands of Massachusetts, on the south-east side of Buzzard's Bay, extending south-west from Barnstaple county, and bearing north-west from Martha's vineyard. Cattahunk, Nashawn, Nashawenna, Pasqui, and Pinequese, are the chief of them. They belong to Duke's county, and lie between long. 70° 38′ and 70° 56′ W., and between lat. 41° 24′ and 41° 32′ N.

ELIZABETH RIVER, a river of the United States, the south head water of which rises from the Great Dismal Swamp, and running through Virginia falls into James River. A navigable canal was begun to be dug in 1797, to connect this river with the Pasquotank, which is fourteen miles distant. The canal company are incorporated by the legislatures of Virginia and North Carolina.

ELIZABETH-TOWN, a post town of New Jersey, in Essex county, seated on a rivulet which runs into Arthur Kull, six miles south of Newark, and fifteen south-west by west of New York. It is one of the oldest towns in the state, having been purchased of the Indians so early as 1664. It has two handsome churches, one for the Presbyterians and one for the Episcopalians; and is fifty-eight miles N. N. E. of Philadelphia, and twelve south-west by west of New York.

ELIZABETH-TOWN, a post town of Maryland, capital of Washington county, formerly called Hagar's Town, seated in the vale of Conecocheaque, six miles from the Potomac. It is regularly built, and has an Episcopalian, a Presbyterian, and a German Lutheran church; with a court house, gaol, &c. It carries on a good trade with the western county; and lies 175 miles west by south of Philadelphia, and fifty north-west of Baltimore.

ELK, *n. s.* Sax. ælc; Swed. *elg;* Goth. *alg;* Ital. and Span. *alce*, from Gr. *αλκη*, strength, according to Watcher. The moose deer.

The *elk* is a large and stately animal of the stag kind. The neck is short and slender; the ears nine inches in length, and four in breadth. The color of its coat in Winter is greyish, in Summer it is paler. The horns of the male *elk* are short and thick near the head, where it by degrees expands into a great breadth, with several prominences in its edges.
*Hill.*

And, scarce his head
Raised o'er the heapy wreath, the branching *elk*
Lies slumbering silent in the white abyss.
*Thomson.*

ELK, in zoology. See CERVUS.

ELK, in geography, a navigable river of the United States, on the eastern shore of Maryland, which rises in Chester county, Pennsylvania, and running S. S. W. thirty-three miles, falls into Chesapeake Bay, on the south side of Turkey Point.

ELK, a short navigable river in Tennessee, and Georgia, which rises in Tennessee, near the head waters of Duck River, and, running south-west, falls into the Tennessee at Muscle shoals.

ELKHORN RIVER, a river of Louisiana, which enters the La Plata about forty miles above its junction with the Missouri. It has a clear gravelly channel, and is about 100 yards wide at its mouth.

ELKRIDGE, a town of Maryland, United States, on the south bank of Patapsco River, eight miles north-west of Baltimore.

ELKTON, a town of Maryland, United States, at the head of Chesapeake Bay, and the capital of Cecil county. It is situated at the confluence of the head branches of the Elk, and enjoys considerable advantages from the carrying trade between Baltimore and Philadelphia. Thirty-seven miles south-west of Philadelphia.

ELL, *n. s.* Sax. eln (and frequently so written by our elder authors); Goth. *aul*, *aulin;* Swed. *aln;* Teut. *elle;* Belg. *el;* Lat. *ulna;* Gr. *ωλενη*. Both the last words, according to Vossius, being spoken of the arm as a measure of length. A measure containing in length one yard and a quarter.

The world produces for every pint of honey, a gallon of gall; for every dram of pleasure, a pound of pain; for every inch of mirth, an *ell* of moan; and as the ivy twines around the oak, so do misery and misfortune encompass the happiness of man.
*Burton.*

Acquit thee bravely, play the man;
Look not on pleasures as they come, but go;
Defer not the last virtue; life's poor span
Makes not an *ell* by trifling in thy woe. *Herbert.*

Upon their wedding-day Mr. Spectator and she had but half an *ell* of face betwixt them; and thy my very worthy predecessor, Mr. Serjeant Thin, always maintained to be no more than the true oval proportion between man and wife. *Spectator.*

They are said to make yearly forty thousand pieces of linen cloth, reckoning two hundred *ells* to the piece. *Addison.*

*The* ELL is a measure different in different countries, by which cloths, stuffs, linens, silks, &c., are usually measured. The ells most frequently used with us are the English and Flemish; the former containing three feet nine inches, or one yard and a quarter; the latter only twenty-seven inches, or three quarters of a yard; so that the ell English is to the Flemish ell as five to three. In Scotland the ell contains thirty-seven two-tenths English inches.

ELLAGIC ACID. The deposit which forms in infusion of nut-galls, left to itself, is not composed solely of gallic acid and a matter which colors it. It contains, besides, a little gallate and sulphate of lime, and a new acid, which was pointed out for the first time by M. Chevreul in 1815, an acid on which M. Braconnot made observations in 1818, and which he proposed to call acid ellagic, from the word galle, reversed. Probably this acid does not exist ready formed in nut-galls. It is insoluble; and, carrying down with it the greater part of the gallic acid, forms the yellowish crystalline deposit. But boiling water removes the gallic acid from the ellagic; whence the means of separating them from one another.

**ELLIPOMACROSTYLA**, in natural history, from ελλιπης, imperfect; μακρος, long; and στυλος, a column; q. d. an imperfect crystal with a long column; the name of a genus of crystals. The perfect figure of a crystal being a column, terminated by a pyramid at each end, those which want this character are esteemed imperfect: and accordingly the bodies of this genus are defined to be imperfect crystals with single pyramids; one end of their column being affixed to some solid body, and composed of thin and slender hexangular columns, terminated by hexangular pyramids. They are dodecahedral. Of these crystals authors enumerate many species, among which are the whitish pellucid sprig crystal, a bright brown kind, a dull brown kind, and a bright yellow kind; all which are farther distinguished according to the different lengths of their pyramids.

ELLIPOPACHYSTYLA, in natural history, from ελλιπης, imperfect; παχυς, thick; and στυλος, a column, q. d. an imperfect crystal with a thick column; a genus of crystals the bodies of which are composed of an hexangular column, considerably thick and short, affixed irregularly at one end to some solid body, and terminated at the other by an hexangular pyramid. There are two species, one short, bright, and colorless, found in great plenty in New Spain, and other parts of America; the other, a short, dull, and dusky brown one, found in Germany, and sometimes in England.

ELLIPSE, or ELLIPSIS, in geometry. See CONIC SECTIONS.

ELLIP'SIS, *n. s.*
ELLIP'TIC, *adj.*
ELLIP'TICALLY, *adv.*
} Fr. *ellipse;* Italian *elisse;* Span. and Port. *elipse,* from Gr. ελλειπσις (from εκ out, or emphat. and λειπω, to fail, Parkhurst). A figure of speech whereby something implied in a sentence is omitted: one of the conic sections, called also an oval; but originally termed an ellipse or ellipsis by Apollonius, because in this figure the squares of the ordinates are less than, or defective in, the rectangles, under the parameters and abscisses.

The words are delivered by way of *ellipsis*, Rom. iv. 18. *Hammond.*

The planets could not possibly acquire such revolutions in circular orbs, or in *ellipses* very little eccentrick. *Bentley.*

On the cylinder inclined, describe an *ellipsis* parallel to the horizon. *Wilkins's Dædalus.*

Since the planets move in *elliptick* orbits, in one of whose foci the sun is, and by a radius from the sun describe equal areas in equal times, which no other law of a circulating fluid, but the harmonical circulation, can account for; we must find out a law for the paracentrical motion, that may make the orbits *elliptick.* *Cheyne's Phil. Prin.*

In animals, that gather food from the ground, the pupil is oval or *elliptical*; the greatest diameter going transversely from side to side. *Id.*

Earths round each sun with quick explosions burst,
And second planets issue from the first;
Bend, as they journey with projectile force,
In bright *ellipses* their reluctant course. *Darwin.*

ELLIS (George), F. R. S. and F. S. A., an ingenious miscellaneous writer, was born in London in 1745, and educated at Westminster school. He afterwards went to Trinity College, Cambridge, and was one of the writers of the celebrated 'Rolliad,' a satirical publication against the administration of Mr. Pitt; but he afterwards became attached to that statesman, and was appointed secretary to lord Malmesbury, on the embassy to Lisle. Mr. Ellis died in 1815. His works are: 1. Specimens of the Early English Poets, 3 vols. 8vo. 2. Preface, Notes, and Appendix, to a Translation of Le Grand's Fabliaux, 2 vols. 8vo. 3. Specimens of English Metrical Romances, 3 vols. 8vo.

ELLIS (John), F. R. S., a zoological and botanical writer, was born in London about 1710; and, applying himself very early in life to scientific observations, discovered the animal nature of corals and corallines, on which subject he published an Essay, 4to. in 1755. He distinguished himself in botany by an account of new plants from America; a description of the Confervæ, and a dissertation on the Varnish Tree of Japan. He also wrote an account of Coffee, a description of the Mangostan and Bread Fruit, and Directions to Voyagers for bringing home Vegetable Productions. He was also the author of various papers in the Transactions of the Royal Society. Lord chancellor Northington gave him the place of agent for West Florida and Dominica. He died in 1776. His Natural History of uncommon Zoophites, was published by his daughter.

ELLISIA, in botany, a genus of the monogynia order, pentandria class of plants, natural order twenty-eighth, luridæ: COR. monopetalous and funnel-shaped; the berry carnous and bilocular: SEEDS two, muricated or set with small raised points, the one higher than the other. Species one only, an annual of Virginia.

ELLORE, or ELURA, one of the northern Circars of Hindostan, is situated between 16° and 17° of N. lat. Ellore and Condapilly occupy the whole of the space between the Krishna and the Godavery. Its superficial contents are estimated at 2700 square miles, exclusive of the high mountainous region on the west. The principal towns are Ellore, Colaircotta, and Gundgoli.

ELLORE, the capital of the above district, is situated on the northern side of the Colair Lake, through which it has lately been proposed to carry a canal from the Godavery to the Kistnah. It possesses a small fort, and formerly had a military cantonment in its vicinity.

ELLSMERE, a market town of Shropshire, sixteen miles north-west of Shrewsbury, and 169 north-west from London. Its principal traffic is in malt, the culture of barley being particularly attended to in its neighbourhood. It derives its name from an extensive lake, or mere, covering 100 acres, and exceedingly well stocked with fish, and its banks ornamented with a well-built town on one side, and the mansion and park, called Oatley, on the other. From the Castle-hill, on which there is one of the finest bowling-greens in the kingdom, there is a distinct view of nine different counties. The church has a square tower, with eight bells. Market on Tuesday.

ELLWANGEN, once the capital of a distric

of this name, is now the chief town in the department of the Kocher, in the kingdom of Wirtemberg, and situated in a pleasant valley on the Jaxt. It is small, but well built, and contains 2100 inhabitants. The catholic university here has been united with the protestant one of Zubingen. Thirty-two miles north of Ulm.

ELLWOOD (T.), an early quaker, and an associate of Milton the poet, published, in his twenty-second year, An Alarm to the Priests on a Message from Heaven to warn them. In 1665 he lodged with Milton at Chalfont, Bucks, and became the occasion of his writing Paradise Regained, by observing, on the return of the Paradise Lost, which the poet had lent him to read, 'Thou hast said much of Paradise lost, but what hast thou to say of Paradise found?' The life of Mr. Ellwood was almost wholly spent in controversy, and his zeal and perseverance in his opinions rendered him constantly liable to the conventicle, and other persecuting laws. In 1705 he published the first part of Sacred History, or the Historical Parts of the Old Testament; and in 1709 Sacred History, &c., of the New Testament. His other works are numerous; one of them, entitled The Foundation of Tithes Shaken, attracted much attention at the time. He also published Davideis, the Life of David, King of Israel, a poem; and died in 1713, aged seventy-four. His life, written by himself, affords several interesting particulars of the early history of his sect.

ELM, *n. s.* } Sax. elm; Fr. *ulme*, and *orme*;
ELM'Y, *adj.* } Lat. *ulmus*. A tree, formerly used to support the vine. See ULMUS.

> Thou art an *elm*, my husband; I a vine;
> Whose weakness married to thy stronger state,
> Makes me with thy strength to communicate.
> *Shakspeare.*

> The rural seat,
> Whose lofty *elms* and venerable oaks,
> Invite the rook, who high amid' the boughs,
> In early Spring, his airy city builds. *Thomson.*

> Through the sandy soil
> Of *elmy* Ross or Devon's myrtle groves.
> *Dyer. Fleece.*

> The simple spire and *elmy* grange. *T. Warton.*

> Round the tall *elm* the flattering ivies bend,
> And strangle, as they clasp, their struggling friend.
> *Darwin.*

ELM, in botany. See ULMUS. The elm is a timber of peculiar property and singular use in situations where it is continually exposed either to the wet, or to be kept dry. Its grain being rough and curly, causes it to be not liable to split. If felled between the months of November and February, it is found to have no sap, and is of peculiar service in mast-making.

ELMACINUS (George), author of a History of the Saracens, was born in Egypt towards the middle of the thirteenth century. His history begins with Mahomet, and continues to the year of the hegira 512, answering to A. D. 1134; in which he sets down year by year, in a very concise manner, whatever regards the Saracen empire, intermixed with some passages relating to the eastern Christians. He was son to Yaser Al Amid, secretary to the council of war under the sultans of Egypt for forty-five years; and in 1238, when his father died, succeeded him in his place, though professing Christianity. His history of the Saracens was translated from Arabic into Latin by Erpinius; and printed in these two languages in folio, at Leyden, in 1625. Erpinius died before the publication.

ELMINA, or ST. GEORGE DEL MINA, the capital of the Dutch settlements on the Gold Coast of Africa, and one of the most respectable fortresses in that neighbourhood, was built originally by the Portuguese, who made it the capital of their settlements upon this coast in 1481. In 1637 it was taken by the Dutch, and ceded to them afterwards by treaty. From this time the Dutch claimed the sole dominion of the Gold Coast, but were soon forced by the English to resign that pretension.

Elmina stands on a peninsula, formed by a small river running nearly parallel with the sea, and the castle has two approaches, one from the town, where it is strengthened by a double ditch, over which are drawbridges; the other adjoining the river, where is a small gate, at an elevation of about twelve feet, to which an ascent is formed by a steep ladder. A fort is built on an eminence adjoining named Conradsburg or St. Jago, and this may be considered the key of Elmina. The town is large and dirty, and the river, though small, will admit vessels of 100 tons burden at high water. It repulsed a respectable English force in 1781; but this is attributed to a want of concert between the commanders. The surrounding country is, for the most part, open and flat, and the soil light, though, in some places, of a heavy clay. The inhabitants consist of traders, fishermen, and persons employed as servants to traders; some among them are wealthy. There are likewise many mulattoes in respectable circumstances here, who support a number of slaves, performing the duties of carpenters, masons, and blacksmiths. The place is supposed, altogether, to contain 15,000 inhabitants. In 1808 the Dutch governor was killed in a conspiracy; but he is said to have been a very turbulent and imprudent man. During the invasion of the Ashantees, the inhabitants of Elmina favored that people, and delivered up to them some of the Fantees who fled to the place. The Fantees, on this, assembled afterwards in great force, but were unable to make any impression upon Elmina. Its trade, previous to these disturbances, was brisk, consisting in slaves and gold, with a little ivory, brought from the interior. Long. 2° 30′ W., lat. 5° 10′ N.

ELMSLEY (Peter), a learned divine and philologist, was born in London in 1773, and educated at Westminster school, whence he removed to Christ Church, Oxford, and took the degree of M. A. in 1797. Soon afterwards he entered into orders, and was presented to the chapelry of Little Horkesley in Essex, but is said to have bestowed all its emolument on his curate. Mr. Elmsley had a respectable private fortune, and after the peace of 1815 went to Italy, and was employed with Sir Humphry Davy in superintending the development of the papyri found at Herculaneum. To Mr. Elmsley was left the choice of the MSS. but the experiment proved

a failure. He settled at Oxford on his return, and took the degree of D. D. In 1823 he was appointed principal of Alban Hall, and Camdenian professor of History; but died of a decline in 1825. Dr. Elmsley was the editor of some of the plays of Euripides and Sophocles, and a writer in the Quarterly Review.

ELOCA'TION, *n. s.* Lat. *elocatus* (*e*, out, and *locare*, to place.) Placing out or from home.

This may without sin or blame be forborne—when the child either by general permission or former *elocation* shall be out of the parents' disposing. *Bp. Hall.*

ELOCU'TION, *n. s.* } Fr. *elocution*; Ital. ELOCU'TIVE, *adj.* } *elocutione*; Span. *elocucion*; Lat. *elocutio* (*e*, out and *loquor* to speak). Fluent or forcible speech; the power or faculty of using fluent speech.

A travelled doctor of physick, of bold, and of able *elocution*. *Wotton.*

Whose taste, too long forborne, at first essay
Gave *elocution* to the mute, and taught
The tongue not made for speech to speak thy praise. *Milton.*

Preaching in its *elocutive* part is but the conception of man. *Feltham.*

The third happiness of this poet's imagination is *elocution*, or the art of cloathing or adorning that thought so found, and varied, in apt, significant, and sounding words. *Dryden.*

And again, as she is a lady of very fluent *elocution*, you need not fear that your first child will be born dumb, which otherwise you might have some reason to be apprehensive of. *Spectator.*

ELOCUTION. See ORATORY.

EL'OGY, *n. s.* } French *eloge*, and *elogiste*; EL'OGIST. } Span. Port. and Ital. *elogio*; Lat. *elogium*; Gr. ευλογια (ευ and λεγειν, to speak well.) A commendatory speech often used synonymously with, and having the same etymology as eulogium; but often also applied in a more general sense.

She did not want a passionate *elogist* as well as an excellent preacher. *Wotton.*

Buckingham lay under millions of maledictions, which at the prince's arrival did vanish into praises and *elogies*. *Wotton.*

If I durst say all I know of the *elogies* received concerning him, I should offend the modesty of our author. *Boyle.*

Some excellent persons, above my approbation or *elogy*, have considered this subject. *Holder's Elements of Speech.*

E'LOIGNE, *v. a.* Fr. *eloigner*. To put at a distance; to remove one far from another. Now disused.

From worldly care himself he did *eloin*,
And greatly shunned manly exercise. *Faerie Queene.*

I'll tell thee now, dear love! what thou shalt do
To anger destiny, as she doth us;
How I shall stay though she *eloigne* me thus,
And how posterity shall know it too. *Donne.*

ELON, the twelfth judge of Israel, and the second after Jephthah, succeeded Ibzan, about A. M. 2830; or, according to Alstedius, 2771. He was of the tribe of Zebulon, and, after governing the republic ten years, died about A.A.C. 1167.

ELONG' *v. a.* } Old Fr. *ehlon-* ELONG'ATE, *v. a.* & *v. n.* } *ger* (to delay); ELONGA'TION, *n. s.* } Sax. lengian, to prolong; Lat. *elongo*. To defer; protract; set far off, in place or time. Elongate, as a neuter verb, means to go off to a distance.

The distant points in the celestial expanse appear to the eye in so small a degree of *elongation* from another, as bears no proportion to what is real. *Glanville's Scepsis.*

The first star of Aries, in the time of Meton the Athenian, was placed in the very intersection, which is now *elongated* and moved eastward twenty-eight degrees. *Browne.*

About Cape Frio in Brasilia, the south point of the compass varied twelve degrees unto the west; but *elongating* from the coast of Brasilia, towards the shore of Africa, it varied eastward. *Id. Vulgar Errours.*

Upon the roof the bird of sorrow sat,
*Elonging* joyful day with her sad note,
And through the shady air the fluttering bat
Did wave her leather sails. *G. Fletcher.*

To this motion of *elongation* of the fibres, is owing the union or conglutination of the parts of the body, when they are separated by a wound. *Arbuthnot on Aliments.*

*Elongations* are the effect of a humour soaking upon a ligament, thereby making it liable to be stretched, and to be thrust quite out upon every little force. *Wiseman's Surgery.*

ELONGATION, in astronomy, the digression or recess of a planet from the sun, with respect to an eye placed on our earth. The term is chiefly used in speaking of Venus and Mercury; the arc of a great circle intercepted between either of these planets and the sun being called the elongation of that planet from the sun.

ELOPE' *v. a.* } Sax. hleapan; Belg. ELOPE'MENT, *n. s.* } *loopen*; Swedish, *lopa*; Goth. *leipa*; Gr. λειπω, to leave. To run away or off from: to escape from; forsake. Applied particularly to the running away of husband or wife with a mistress or lover.

An *elopement* is the voluntary departure of a wife from her husband to live with an adulterer, and with whom she lives in breach of the matrimonial vow. *Ayliffe's Parergon.*

It is necessary to treat women as members of the body politic, since great numbers of them have *eloped* from their allegiance. *Addison's Freeholder.*

What from the dame can Paris hope?
She may as well from him *elope*. *Prior.*

The negligent husband, trusting to the efficacy of his principle, was undone by his wife's *elopement* from him. *Arbuthnot.*

The fool whose wife *elopes* some thrice a quarter,
For matrimonial solace dies a martyr. *Pope.*

Is he not thine own,
Thyself in miniature, thy flesh, thy bone?
And hopest thou not ('tis every father's hope)
That, since thy strength must with thy years *elope*,
And thou wilt need some comfort to assuage
Health's last farewell, a staff in thine old age,— *Cowper.*

*An* ELOPEMENT, in law, frees the husband from an obligation to allow the adulteress any alimony out of his estate; nor is he chargeable for necessaries for her of any kind. However, the bare advertising a wife in the gazette, or other public paper, is not a legal notice to persons in general not to trust her; though a personal no-

tice given by the husband to particular persons is said to be good.—An action lies, and large damages may be recovered against a man for carrying away and detaining another man's wife.

ELOPS, *n. s.* Gr. ἔλοψ. A fish. See ACCIPENSER; reckoned, however, by Milton among the serpents.

Scorpion and asp, and amphisbena dire,
Cerastes horned, hydrus, and *elops* drear,
And dipsas. *Milton's Paradise Lost.*

EL'OQUENCE, *n. s.*
EL'OQUENT, *adj.*
EL'OQUENTLY, *adv.*
Latin, *eloquentia.* See ELOCUTION. The act or power of speaking well or fluently: the adjective and adverb strictly follow this meaning.

The Lord of hosts doth take away the captain of fifty, and the honorable man, and the counsellor, and the cunning artificer, and the *eloquent* orator. *Isaiah*, iii. 3.

Action is *eloquence*, and the eyes of the ignorant
More learned than the ears. *Shakspeare. Coriolanus.*

Athens or free Rome, where *eloquence*
Flourished since mute. *Milton.*

At the New Exchange they are *eloquent* for the want of cash, but in the city they ought with cash to supply their want of *eloquence.* *Spectator.*

*Eloquence* must flow like a stream, that is fed by an abundant spring, and not spout forth a little frothy water on some gaudy day, and remain dry the rest of the year. *Bolingbroke.*

His infant softness pleads a milder doom,
And speaks with all the *eloquence* of tears. *Heigh.*

True *eloquence* is good sense, delivered in a natural and unaffected way, without the artificial ornament of tropes and figures. *Baker.*

O death! all *eloquent*, you only prove
What dust we dote on, when 'tis man we love.
*Pope.*

Fit words attended on his weighty sense,
And mild persuasion flowed in *eloquence.*
*Id. Odyssey.*

Great is the power of *eloquence*; but never is it so great as when it pleads along with nature. *Sterne.*

And on that cheek, and o'er that brow,
So soft, so calm, yet *eloquent*,
The smiles that win, the tints that glow,
But tell of days in goodness spent. *Byron.*

ELOQUENCE. See ORATORY.

ELORA, or ELURA, a town in the province of Aurungabad, near Dowletabad, Hindostan, and named on the spot Verrool. About a mile to the east of this town are some remarkable excavations in a mountain, consisting of Hindoo temples and mythological symbols, which in magnitude, and perfection of execution, excel any thing of the kind in India. They are described at great length in the sixth volume of the Asiatic Researches, and appear to have been dedicated to Siva or Mahadeva. The brahmins on the spot assert that they were formed by Eeloo, rajah of Ellichpoor 7914 years ago. The rajah's successors probably added other temples; and the cistern still retains its fame and sanctity, under the appellation of Sewalla koond. This, with the temple, is one of the many objects of Hindoo pilgrimage. Long. 76° 0' E., lat. 19° 56' N.

ELPHINSTONE (William), a Scottish prelate and distinguished statesman, was born at Glasgow in 1431, and received his education at the university of that city. After which he went over to France, for the purpose of attaining a perfect knowledge of the civil and canon law, in the university of Paris, where he afterwards became a professor. Returning to Scotland, he entered into holy orders, was soon appointed official of Glasgow, and afterwards of St. Andrews. He was admitted a member of the king's council, and soon after promoted to the see of Ross. He was translated from this to the diocese of Aberdeen about the year 1484, and was also appointed to the high office of chancellor of the kingdom. When James IV. ascended the throne he was chosen ambassador to the emperor Maximilian, and he was the means of terminating an enmity which had long existed between the Dutch and Scotch. The bishop was no less the zealous patron of learning; and it was through his influence that James IV. applied for and obtained a bull from the pope for the establishment of a university at Aberdeen. King's College, of which he is generally considered as the founder, was undertaken and completed by his exertions; and at his death he bequeathed large sums of money for its support. He died in 1514, in the eighty-third year of his age. He wrote a history of Scotland, which is among the MSS. of Sir Thomas Fairfax, in the Bodleian library at Oxford.

ELSE, *pron.* & *conj.*
ELSE'WHERE, *adv.*
Saxon, elleꞅ, alyꞅ; Goth. *alia, ellar, elegar*; Dan. *ellers*; Swed. *eller, ællas.* According to Mr. H. Tooke, the Saxon words elleꞅ and alyꞅ are the imperative of aleꞅan and alyꞅan, to dismiss. Other one besides; otherwise. Elsewhere, is in any other place.

And no man putteth newe wyn into olde botels, *ellis* the wyn schal berste the botels.
*Wiclif. Mark* 2.

But I would now,
Comen with you,
In counsayle yf you please,
Or *ellys* not
Of matters that
Shall set your heart at ease.
*Sir T. More.*

They which *elsewhere* complain, that injury is offered to the meanest minister, when the magistrate appointeth him what to wear, think the gravest prelates no competent judges where it is fit for the minister to stand. *Hooker.*

In forming a judgment, lay your hearts void of foretaken opinions; *else* whatsoever is done or said will be measured by a wrong rule. *Sir P. Sidney.*

To stand stained with travel, and sweating with desire to see him; thinking of nothing *else*, putting all affairs *else* in oblivion, as if there were nothing *else* to be done but to see him.
*Shakspeare. Henry IV.*

As he proved that Pison was not Ganges, or Gehon, Nilus, so where to find them *elsewhere* he knew not.
*Raleigh's History.*

There are here divers trees, which are not to be found *elsewhere.* *Abbot's Description of the World.*

He says, 'twas then with him, as now with you,
He did it when he had nothing *else* to do. *Denham.*

Let us no more contend nor blame
Each other, blamed enough *elsewhere.* *Milton.*

Should he or any *else* search, he will find evidence of the Divine Wisdom. *Hale's Origin of Mankind.*

They rub the frozen parts with snow, or *else* cast the whole body into water, by which means the whole body is crusted over with ice.
*Boyle. An account of Freezing, made in* 1662.

What ways are there whereby we should be assured, but either by an internal impression of the notion of a God upon our minds, or *else* by such external and visible effects as our reason tells us must be attributed to some cause. *Tillotson.*

If it contradict what he says *elsewhere*, it is no new or strange thing. *Id.*

None ever was a great poet that applied himself much to any thing *else*. *Sir W. Temple.*

Bestow, base man, thy idle threats *elsewhere* ;
My mother's daughter knows not how to fear.
*Dryden.*

The fool is blind to those blemishes in his character which are conspicuous to every body *else*.
*Mason.*

ELSHEIMER (Adam), a celebrated painter, born at Frankfort on the Maine in 1574. He was first a disciple of Philip Uffenbach a German; but going to Rome he soon became celebrated for landscapes, history, and night-pieces, with small figures. His works are but few; and the great pains he bestowed in finishing them raised their prices so high that they are seldom to be found but in the cabinets of princes. He was of a melancholy turn, and sunk under the embarrassments of his circumstances, in 1610. James Ernest Thomas, of Landau, was his disciple; and imitated his style so nicely, that their performances are not easily distinguished.

ELSIMBURG, or Helsimburg, a port town of Sweden, in the province of Gothland, and territory of Schonen, seated on the side of the Sound, seven miles east of Elsinore. It was formerly a fortress belonging to the Danes; but all the fortifications were demolished in 1679, and there is only one tower of a castle which remains undemolished. Long. 13° 20′ E., lat. 56° 2′ N.

ELSINEUR, Elsinoor, Elsinore, or Helsingoer, a port town of Denmark, seated on the Sound, in the isle of Zealand, twenty miles north of Copenhagen. It was a small village, containing a few fishermen's huts, until 1445, when it was made a staple town by Eric of Pomerania; who conferred upon the new settlers considerable immunities, and built a castle for their defence. From that period it gradually increased in size and wealth, and is now the most commercial place in Denmark, next to Copenhagen. It contains about 7000 inhabitants, amongst whom are a considerable number of foreign merchants, several British establishments, and the consuls of the principal nations trading to the Baltic. The passage of the Sound is guarded by the fortress of Cronborg, which is situated upon the edge of a peninsular promontory, the nearest point of land from the opposite coast of Sweden. It is strongly fortified towards the shore by ditches, bastions, and regular intrenchments; and toward the sea by several batteries; but it was found, in 1801, incapable of resisting the passage of a fleet. Every vessel, as she passes, lowers her top-sails, and pays a toll of one per cent. on the value of her cargo at Elsineur. The product of the toll has been differently stated; it varies from £120,000 to £150,000 sterling. The number of vessels is estimated at about 10,000; and one and a quarter per cent. is said to be levied on all vessels but the British, French, Dutch, and Swedish.

ELSTER, the name of two rivers of Germany, one of which, called the White Elster, rises in the south of Saxony, and holding a northern course, near Leipsic, falls into the Saale. A considerable pearl-fishery is carried on on its banks near Oelsnits. The Black Elster rises to the eastward in Lusatia, and, after a northeasterly course, falls into the Elbe six miles above Wittenburg. Near the influx of this river Blucher crossed the Elbe on the 3rd October 1813, and marched to the memorable battle of Leipsic.

ELSTOB (William), a celebrated Saxon scholar and critic of the last century, was born at Newcastle in 1673, and received his education at Eton, at Catherine Hall, Cambridge, and subsequently at Queen's College, Oxford, whither he removed for the sake of his health. He obtained a fellowship in 1696, and was admitted M. A. in the following year. In 1701 he translated the Saxon homily of Lupus into Latin, with notes, and was soon after appointed rector of the united parishes of St. Swithin and St. Mary Bothaw, London. In 1709 he published The Homily on St. Gregory's Day, in Saxon, with a Latin translation; and died in 1714. He had formed the design of publishing a collection of the laws of the Anglo-Saxons, with a Latin version and notes of various authors. He had also transcribed the Anglo-Saxon translation of Orosius, by Alfred the Great, a specimen of which was printed in 1699, under the title of Hormesta Pauli Orosii. He left a learned sister, Elizabeth Elstob, who published a Saxon grammar.

ELVAS, one of the most important towns of Portugal, is situated in the province of Alentejo, a few miles from the frontiers of Spanish Estremadura. It is built on a mountain, and fortified. The streets were once handsome, and the houses neat; but the whole place has a decayed appearance. There is a cistern here so large that it will hold water enough to supply the whole town six months. It is conveyed to it by a magnificent aqueduct, three miles in length, sustained in some places by four or five high arches, one upon another. Elvas was bombarded by the French and Spaniards in 1706, but without effect. It has generally a garrison of 1000 men, and the population is about 16,000. The king founded an academy here, in 1733, for young gentlemen. Elvas is seated near the Guadiana; fifty miles north-east of Evora, and 100 east of Lisbon.

ELU'CIDATE, *v. a.*
Elucida'tion, *n. s.*
Elu'cidator.
} Fr. *elucider* ; Latin, *elucido* ; *e* and *lucido*, to shine. To make clear, bright, or plain.

Obscurity is brought over them by the course of ignorance and age, and yet more by their pedantical *elucidators*. *Abbot.*

To *elucidate* a little the matter, let us consider it. *Boyle.*

We shall, in order to the *elucidation* of this matter, subjoin the following experiment. *Id.*

ELUCTATION, *n. s.* Lat. *eluctatus, eluctari*. A bursting or struggling forth; escape.

There is nothing more acceptable to the ingenious, than this noble *eluctation* of truth. *Browne.*

ELUDE', *v. a.* } Lat. *eludo; e*, and *ludo*,
ELUD'IBLE, *adj.* } to deceive. To escape
ELU'SION, *n. s.* } from, by stratagem: elu-
ELU'SIVE, *adj.* } dible is possible, or likely,
ELU'SORY. } to be eluded; elusion, escape by artifice or fraud; elusive and elusory, deceptive, tendency to impose upon or cheat.

It may be feared that they are but Parthian flights, ambuscade retreats, and *elusory* tergiversation.
*Browne's Vulgar Errours.*

The passion of some lovers is such that it *eludes* the rigor of their fortune, and baffles the force of a blow, which neither feels, because each receives it for the sake of the other. *Tatler.*

Several pernicious vices, notorious among us, escape or *elude* the punishment of any law yet invented.
*Swift.*

There is not any common place more insisted on than the happiness of trials by juries; yet, if this blessed part of our law be *eludible* by power and artifice, we shall have little reason to boast. *Id.*

An appendix, relating to the transmutation of metals, detects the impostures and *elusions* of those who have pretended to it. *Woodward's Nat. Hist.*

He who looks no higher for the motives of his conduct than the resentments of human justice, whenever he can presume himself cunning enough to *elude*, rich enough to bribe, or strong enough to resist it, will be under no restraint. *Rogers.*

Me gentle Delia beckons from the plain,
Then, hid in shades, *eludes* her eager swain;
But feigns a laugh to see me search around,
And by that laugh the willing fair is found.
*Pope.*

*Elusive* of the bridal day, she gives
Fond hopes to all, and all with hopes deceives.
*Id.*

But the king's eagerness to obtain liberty *eluded* all their vigilance. *Robertson. Hist. of Scotland.*

Whilst Amaryllis turns with graceful ease
Her blushing beauties, and *eludes* the breeze.—
Sylphs! if at noon the fritillary droops,
With drops nectareous hang her nodding cups.
*Darwin.*

ELVELA, in botany, a genus of the natural order of fungi belonging to the cryptogamia class of plants. The fungus is turbinated, or like an inverted cone.

ELUTE, *v. a.* Lat. *eluo*. To wash off.

The more oily any spirit is, the more pernicious; because it is harder to be *eluted* by the blood.
*Arbuthnot on Aliments.*

ELUTRIATE, *v. a.* Lat, *elutrio*. To decant, or strain out.

The pressure of the air upon the lungs is much less than it has been computed by some; but still it is something, and the alteration of one-tenth of its force upon the lungs must produce some difference in *elutriating* the blood as it passes through the lungs.
*Arbuthnot on Air.*

Though coal and clay are frequently produced in this manner, yet I have no doubt but that they are likewise often produced by *elutriation*. *Darwin.*

ELUTRIATION, in chemistry, an operation performed by washing solid substances with water, stirring them well together, and hastily pouring off the liquid, while the lighter part remains suspended in it, that it may thereby be separated from the heavier part. By this operation metallic ores are separated from earth, stones, and other unmetallic particles adhering to them.

ELY, a city of England, in the county of Cambridge, situated on the river Ouse, in a marshy district called the Isle of Ely. Its Saxon name was Suth Gurwa, but, according to Bede, it obtained the name Elig, or Elye, from the abundance of eels produced in the fens and waters of the neighbourhood. It consists of one principal street, and some smaller and very irregular ones. Its chief interest, as a city, is derived from its venerable Anglo-Norman cathedral, which extends in length 517 feet, having a tower at the west end 270 feet in height. Ely was first constituted a bishopric in the year 1109. The cathedral is clearly the work of different ages, and displays a curious mixture of the circular, and the English or pointed, styles of architecture. That part of the tower which is termed the Lantern is particularly admired. This is the only city of England not represented in parliament. Mr. Bentham's celebrated description of the cathedral is one of the most elegant works of the kind in our language. Here is a free school supported by the dean and chapter, and a charity school founded in the last century. The neighbourhood is productive, and laid out very largely in garden-ground. The market is weekly, and there are two annual fairs. It is fourteen miles north of Cambridge, and sixty-six north of London.

The Isle of Ely is a royal franchise, in which the bishop of this diocese exercises a civil jurisdiction, which extends to his appointment of a judge of assize and the other magistrates; so that the twelve judges of England have no circuit or jurisdiction here. When a special commission was issued, some few years ago, to try some rioters at Ely, it was found that the king could grant no legal power to try offences within the isle, apart from the bishop, whose chief justice was therefore included in the commission. Strictly speaking the Isle of Ely, according to Bentham, is that large tract of highland encompassed with fens, which were formerly overflowed with water, of which Ely is the principal place, and gives name to the whole: in which are included also the villages of Stretham and Thetford, Wilburton, Hadenham, Sutton, Mepal Wenham, Wentford, Whichford, Downham, and Chetisham, making collectively but one island. Littleport, Covenay, and Stretney, though sometimes reckoned part of it, were in their original state disjoined by small intervals of fenny ground, and therefore were distinct islands of themselves. This tract is about seven miles in length, and four in breadth. 'But the whole district now called the Isle of Ely, extends from the bridge at Tyd on the north to Upwere on the south, twenty-eight miles in length; and from Abbot's or Bishop's Delf on the east, to the river Nene, near Peterborough, on the west, twenty-five miles in breadth. This district, besides the places above mentioned, includes several considerable towns and villages, as Wisbeach, Whittlesey, Doddington, March Leverington, Newton, Chatteris, &c.

ELY, ELIE, or ELLIE, from a liche, Gaelic, i. e. out of the sea; an ancient royal borough, in

parish of the same name, on the south coast of Fife, built so near the sea that it washes the walls in some places, and seems to threaten to resume what it gave, if tradition be true, that the town was originally built out of it. It has an excellent harbour, the deepest in the Frith, except that of Brunt Island. It has been the means of saving many a ship, cargo, and seaman, that would otherwise have been driven out of the Frith. Vessels of considerable size are built; and manufactures of checks, bedticks, and ropes, are carried on in Ely. Rubies have been found on the shore.

ELYDORIC PAINTING, from ἔλαιον oil, and ὕδωρ, water; in the fine arts is a method of painting in a vehicle composed of oil and water. This method was invented by M. Vincent, of Montpetit. It takes its name from the before quoted Greek words, denoting oil and water, both these liquids being employed in its execution. Its principal advantages are, that the artist is able to add the freshness of water-colors, and the high finishing of miniature, to the mellowness of oil-painting, in such a manner that the work appears like a large picture seen through a concave lens.

The following is the manner of proceeding: a piece of very fine linen, or white taffety, is sized with starch in the most equal manner possible, on pieces of glass about two inches square, in order that the cloth may be without wrinkles. When these are sufficiently dry, a layer of white lead, finely ground in oil of pinks or poppies, the whitest that can be procured, is to be applied on them with a pallet-knife. To this layer, when dry enough to admit of scraping, more is to be added, if necessary.

As it is of very great importance, for the preservation of this kind of painting, that the layers be free from oil, that they may better imbibe the colors laid on them, it is necessary that their surface be made very smooth, and that it be very dry and hard. The artist is next to procure a circle of copper, about two inches diameter and one-fourth of an inch in height, extremely thin, and painted black on the inside. This circle is to contain the water on the surface of the picture.

Water distilled from rain or snow is preferable to any other; ordinary water, on account of the salts which it contains, being pernicious to this mode of painting. The colors are to be finely levigated between two oriental agates, carefully preserved from dust, and mixed with oil of poppies, or any other cold siccative oil which should be as limpid as water.

All the colors being ground, are to be placed in small parcels on a piece of glass, and covered with distilled water. The materials being thus prepared, the subject to be painted is to be faintly traced with a black-lead pencil on one of the pieces of cloth abovementioned. The tints are then to be formed on the pallet from the little heaps under the water; and the pallet placed, as usual, in the left hand. The picture is to be held between the thumb and fore-finger, supported by the middle finger, and the necessary pencils the third and little fingers. The hands rest on the back of a chair to give a full liberty of bringing the work nearer to, or removing it far from the eye.

After having made the rough draft, with the colors still fresh, the circle of copper, which is to surround the picture, is to be fitted exactly to the surface. Distilled water is then poured within this circle till it rises to the height of one-eighth of an inch, and the eye is held perpendicular over the object. The third finger of the right hand, while painting, should rest on the internal right angle of the picture. The work is then to be retouched, the artist adding color and softening as he finds requisite. As soon as the oil swims on the top, the water is poured off, and the picture carefully covered with a watch-glass, and dried in a box by a gentle heat. When dry enough, it is to be scraped nearly smooth with a knife, the artist repeating the former method till he is satisfied with his work.

It is at this period that the advantage of this new method particularly shows itself for the purpose of finishing; as the water poured on the picture discovers every fault of the pencil, and gives the power of correcting and perfecting it with certainty. When the work is finished, it is put under a fine glass, from which the external air is excluded, and then it is dried by means of a gentle heat.

ELYMAIS, the capital of Elam, or Persia. We are told, 1 Mac. vi. 1, that Antiochus Epiphanes, having understood that there were very great treasures lodged in a temple at Elymais, determined to plunder it; but the citizens, getting intelligence of his design, made an insurrection, forced him out of the city, and obliged him to fly. The author of the second book of Maccabees, ix. 2, calls this city Persepolis, in all probability because formerly it was the capital of Persia; for it is known, from other accounts, that Persepolis and Elymais were two very different cities, the latter situated upon the Eulæus, the former upon the Araxes.

ELYMUS, in botany, a genus of the digynia order and triandria class of plants: CAL. lateral, bivalved, aggregate, and multiflorous. Species twelve, of which three are common in England.

ELY'SIUM, *n. s.* } Lat. See the article.
ELY'SIAN, *adj.* } The place assigned by the heathens to happy souls; any place exquisitely pleasant.

> To have thee with thy lips to stop my mouth,
> So should'st thou either turn my flying soul,
> Or I should breathe it so into thy body,
> And then it lived in sweet *Elysium*.
> *Shakspeare. Hen. VI.*
>
> The river of life, through midst of heaven,
> Rolls o'er *elysian* flowers her amber stream. *Milton.*
>
> Pleasures which no where else were to be found,
> And all *Elysium* in a spot of ground. *Dryden.*
>
> Admiring Proserpine through dusky glades
> Led the fair phantom to *Elysian* shades,
> Clad with new form, with finer sense combined,
> And lit with purer flame the ethereal mind.
> *Darwin.*
>
> O who of man the story will unfold,
> 'Ere victory and empire wrought annoy,
> In that *elysian* age, misnamed of gold,
> The age of love, and innocence, and joy,
> When all were great and free! man's sole employ
> To deck the bosom of his parent earth. *Beattie.*

ELYSIUM, Ἠλύσιος, in the ancient mythology, was represented as a place in the inferi, or lower world, furnished with fields, meads, agreeable woods, groves, shades, rivers, &c., whither the souls of the virtuous were supposed to go after this life. Orpheus, Hercules, and Æneas, were said to have descended into Elysium in their life-time, and to have returned again, Virgil, lib. vi., v. 638. Virgil assigns Elysium to patriots who died for their country, to those of pure lives, to truly inspired poets, to the inventors of arts, and to all who have done good to mankind. Homer describes the Ἠλύσιον πέδιον, Odyssey, lib. iv.

> *Οὐ νιφετὸς οὔτ' ἀρ χειμὼν πολὺς οὔτε ποτ' ὄμβρος,*
> *Αλλ' αἰεὶ ζεφύροιο λιγυπνείοντος ἀήτας,*
> *Ωκεανὸς ἀνίησιν ἀναψύχειν ἀνθρώπης.*

Virgil introduces Anchises, saying,

> Exinde per amplum
> Mittimur Elysium, et pauci læta arva tenemus:
> Donec longa dies perfecto temporis orbe
> Concretam exemit labem, purumque reliquit
> Æthereum sensum, atque auraï simplicis ignem.
> Has omnes, ubi mille rotam volvêre per annos,
> Lethæum ad fluvium Deus evocat agmine magno:
> Scilicet immemores supera ut convexa revisant,
> Rursus et incipiant in corpora velle reverti.
> *Æneid*, lib. vi., v. 743.

The Elysian fields were, according to some, in the Fortunate Islands, on the coast of Africa. Others place them in the island of Leuce. Virgil says they were situated in Italy. According to Lucian, they were near the moon; or, in the centre of the earth, if we believe Plutarch.

ELZEVIRS (Lewis, Bonaventure, Abraham, Lewis, and Daniel), five celebrated printers at Amsterdam and Leyden, who, in the neatness and elegance of their small characters, greatly excelled all their predecessors. Their Virgil, Terence, and Greek Testament, have been reckoned their master-pieces; and, indeed, justly gained them the reputation of being the best printers in Europe. The first Lewis Elzevir began business at Leyden in 1590, and was remarkable for being the first who observed the distinction between the *v* consonant and *u* vowel, which had been recommended by Ramus and other writers long before, but never regarded. Daniel died in 1680 or 1681: and, though he left children who carried on the business, is esteemed the last of his family who excelled in it. He published the last of their typographical catalogues in seven parts.

EMA'CIATE, *v. a.* & *n.* & *adj.* } Lat. and
EMACIA'TION. } Ital. *emaciare; e*, and *maceo*, from Gr. *μακρος*, long; according to Vossius because bodies as they become lean, or lose their breadth, appear to increase their length. To deprive of flesh; to waste; to become meagre or lean: as an adjective, sunk; deprived of flesh: emaciation is the state of one grown lean.

Men after long *emaciating* diets wax plump, fat, and almost new. *Bacon.*

All dying of the consumption, die *emaciated* and lean. *Graunt's Bills of Mortality.*

Searchers cannot tell whether this *emaciati*[...] leanness were from a phthisis, or from a hectic f[...] *Gra*[...]

He *emaciated* and pined away in the too an[...] inquiry of the sea's reciprocation, although drowned therein. *Brou*[...]

To those who are past the meridian of life, [...] have dry skins, and begin to be *emaciated*, the w[...] bath, for half an hour, twice a week, I believe [...] eminently serviceable in retarding the advanc[...] age. *Darw*[...]

EMAC'ULATE, *v. a.* } Lat. *emaculo*, f[...]
EMACULA'TION, *n. s.* } *e*, privative, and *cula*, a stain or spot. To make clean; take spots or stains.

Others have taken great pains with him [Taci[...] in *emaculating* the text. *Hal*[...]

EM'ANATE, *v. n.* } Fr. *emaner*; Lat. *e*[...]
EM'ANANT, *adj.* } *nare*, from *e*, and *ma*[...]
EMANA'TION, *n. s.* } to run in a small strea[...]
EMANA'TIVE, *adj.* } To proceed or is[...]
EM'ANE, *v. n.* } from; emane has [...] same signification; emanant is issuing fr[...] something else.

The experience of those profitable and excell[...] *emanations* from God, may be, and commonly a[...] the first motive of our love. *Taylo*[...]

The first act of the divine nature, relating to [...] world, and his administration thereof, is an *emana*[...] act: the most wise counsel and purpose of Almigh[...] God terminate in those two great transient or *emana*[...] acts or works, the work of creation and providence. *Hale's Origin of Mankind*

It is against the nature of *emanative* efforts to su[...] sist but by the continual influence of their causes. *Glanville*

Another way of attraction is delivered by a tenuo[...] *emanation*, or continued effluvium, which, after som[...] distance, retracteth unto itself; as in syrups, oils, an[...] viscosities, which spun, at length retire into thei[...] former dimensions. *Browne.*

> Such were the features of her heavenly face;
> Her limbs were formed with such harmonious grace
> So faultless was the frame, as if the whole
> Had been an *emanation* of the soul. *Dryden.*

The actions, which naturally flow from such a well-formed mind, please us also, as the genuine marks of it; and being, as it were, natural *emanations* from the spirit and disposition within, cannot but be easy and unconstrained. *Locke.*

Swift, in his proposals for a Chamber of Fame, says, 'All news-writers are excluded, because they consider fame as it is a report which gives foundation to the filling up their rhapsodies, and not as it is the *emanation* or consequence of good and evil actions.' *Tatler.*

Aristotle said, that it streamed by connatural result and *emanation* from God, the infinite and eternal Mind, as the light issues from the Sun. *South.*

> Each *emanation* of his fires
> That beams on earth, each virtue he inspires;
> Each heart he prompts, each charm he can create;
> Whate'er he gives, are given for you to hate. *Pope.*

We may even seem to hear the Supreme Intelligence give this commission to the spirits which *emaned* from him. *Sir W. Jones.*

> But wisdom loves the calm and serious hour,
> When heaven's pure *emanation* beams confessed;
> Rage, ecstacy, alike disclaim her power,
> She wooes each gentler impulse of the breast.

EMAN'CIPATE, *v. a.* } Fr. *emanciper*;
EMANCIPA'TION, *n. s.* } Spanish, *emancipare*;
EMAN'CIPATOR. } Ital. and Lat. *emancipare*, from *e*, from, *manu*, the hand, and *capere*, to take. To take from the hand or power; to free from labor or servitude; to set at liberty; an emancipator is he who bestows freedom on another.

Having received the probable inducements of truth, we become *emancipated* from testimonial engagements. *Browne.*

Obstinacy in opinions holds the dogmatist in the chains of error, without hope of *emancipation*. *Glanville's Scepsis.*

By the twelve tables, only those were called unto the intestate succession of their parents that were in the parents' power, excluding all *emancipated* children. *Ayliffe's Parergon.*

They *emancipated* themselves from dependence. *Arbuthnot.*

By the former, he has *emancipated* property; by the latter, he has quieted conscience; and, by both, he has taught that grand lesson to government and subject—no longer to regard each other as adverse parties. *Burke.*

When a proposal is made to *emancipate* or relieve, you hesitate, you deliberate for years, you temporise and tamper with the minds of men; but a death-bill must be passed off hand, without a thought of the consequences. *Byron.*

Let us refute the sophisms of both, and first of the *emancipators*. *Merits of the Catholics, &c.*

EMANCIPATION, in the Roman law, the setting free a son from the subjection of his father; so that whatever moveables he acquired belonged as property to him, and not to his father, as before emancipation. Emancipation put the son in a capacity of managing his own affairs, and of marrying without his father's consent, though a minor. Emancipation differs from manumission, as the latter was the act of a master in favor of a slave; whereas the former was that of a father in favor of his son. There were two kinds of emancipation, viz.

EMANCIPATION, EXPRESS, where the father declared before a judge, that he emancipated his son. In performing this, the father was first to sell his son imaginarily to another, whom they called pater fiduciarius, father in trust; of whom being bought back again by the natural father, he manumitted him before the judge by a verbal declaration.

EMANCIPATION, TACIT, by the son's being promoted to some dignity, by his coming of age, or by his marrying, in all which cases he became his own master of course.

EMAS'CULATE, *v. a.* & *adj.* } Lat. *e*, and
EMASCULA'TION. } *masculus*, from *mas*, a male. To deprive of manhood or virility; hence, to deprive of strength or fortitude: as an adjective, emasculate signifies weakened, effeminate, unmanned.

Whence it is found how many ewes, suppose twenty, the ram will serve, we may geld nineteen, or thereabouts; for if you *emasculate* but ten, you shall, by promiscuous copulation, hinder the increase. *Graunt.*

From wars and from affairs of state abstain;
Women *emasculate* a monarch's reign. *Dryden.*

Dangerous principles impose upon our understandings, *emasculate* our spirits, and spoil our temper. *Collier.*

EMBABE, a small town of Egypt, opposite to Boulac, the port of Cairo. It produces excellent butter, and the fertile plains around enable it largely to supply Lower Egypt with a species of lupine. Near this place was fought, in 1798, the battle between Buonaparte and the Mamelukes, commonly called the Battle of the Pyramids, in which the former forced the latter to retire into Upper Egypt.

EMBALE', *v. a.* Fr. *emballer*; Germ. *emballen*. To make up in bales or parcels.

Below her arm her weed did somewhat train,
And her straight legs most bravely were *embaled*
In golden buskins of costly cordwain. *Faerie Queene.*

EMBALM', } Fr. *embaumer*; Span. and
EMBALM'ER. } Port. *embalsamar*; Ital. *imbalsamare*, from Lat. *balsamum*, balm, the principal ingredient used in preserving the dead among the ancients. Minsheu. See BALM. To impregnate with balm or aromatics; to preserve from destruction or putrefaction.

So Joseph died, and they *embalmed* him, and he was put in a coffin in Egypt. *Bible. Gen.* l. 26.

The Romans were not so good *embalmers* as the Egyptians, so the body was utterly consumed. *Bacon's Nat. Hist.*

I would show future times
What you were, and teach them t' urge towards such:
Verse *embalms* virtue, and tombs or thrones of rhymes
Preserve frail transitory fame as much
As spice doth bodies from corrupt air's touch. *Donne.*

Muse! at that name thy sacred sorrows shed;
Those tears eternal that *embalm* the dead. *Pope.*

Though time still wears us, and we must grow old,
Such men are not forgot as soon as cold,
Their fragrant memory will outlast their tomb,
*Embalmed* for ever in its own perfume. *Cowper.*

EMBALMING is the opening a dead body, and filling it with odoriferous and desiccative drugs and spices, to prevent its putrefying. The Egyptians excelled all other nations in the art of preserving bodies from corruption; for some, that they have embalmed upwards of 2000 years ago, remain entire to this day, and are brought into other countries as great curiosities. They are said to have drawn out the brains with an iron scoop at the nostrils, and to have thrown in medicaments to fill up the vacuum: they also took out the entrails, and having filled the body with myrrh, cassia, and other spices, except frankincense, proper to dry up the humors, they pickled it in nitre, in which it lay for seventy days. The body was then wrapped up in bandages of fine linen and gums, and was delivered to the kindred of the deceased, entire in all its features, the very hairs of the eye-lids being preserved. They used to keep the bodies of their ancestors, thus embalmed, in mausoleums magnificently adorned. The Egyptians also embalmed birds, &c. The prices for embalming were different: the highest was a talent, the next twenty-nine minæ; but those who could not afford this expense, contented themselves with infusing, by means of a syringe, a liquor extracted from the

cedar, and wrapping up the body in salt of nitre; the oil thus preyed upon the intestines, so that when they took it out, the intestines came away with it, dried, and not in the least putrefied; the body being enclosed in nitre, grew dry, and nothing remained besides the skin glued upon the bones. The modern Egyptians are said to wash the body several times with rose-water, and afterwards to perfume it with incense, aloes, and other odors, of which they are by no means sparing; they then bury it in a winding-sheet, made partly of silk and partly of cotton, and moistened with some sweet-scented water or perfume. This they cover with another cloth of unmixed cotton, to which they add one of the richest suits of clothes of the deceased. See MUMMY.

EMBANKMENT, in civil engineering, is a mound, dam, or wall of earth, or other materials applied to the direction or protection of water courses, or the preservation of land from the encroachments of the sea. It may also form the boundary of a dock or reservoir, and be the foundation of roads or railways.

The history of the earliest civilised state in the world, Egypt, must have taught mankind at a very remote period the value of alluvial deposits; and hence the importance of some species of embankment. The whole of that country, we know, is divisible into absolute deserts, and a soil rendered highly fertile from this source. Babylon was in the same situation with regard to the character of her fertile soil. It was a saponaceous clay irrigated by the waters of the Euphrates: a causeway leading over these low grounds to her celebrated bridge, is one of the most famous embankments upon record. All the early civilised nations indeed seem to have chosen alluvial plains and valleys as their favorite residences—'plains well watered every where,' as the Scripture so well expresses it: and where the soil by its mingled warmth and moisture should more quickly and amply repay their rude toil.

The Greeks, inhabiting a rocky and hilly country, interspersed with rich vales, but having a soil generally light and sandy, or a calcareous subsoil, had little occasion for embankments of any kind, and have left therefore but few traces of the art of constructing them. According to Potter, lands were enclosed with a ring-fence, or boundary mark; but most of the country was open pasture. Solon regulates the depth of water, and decrees that 'he who digs a ditch, or makes a trench nigh another's land, shall leave so much distance from his neighbour as the ditch or trench is deep.'

The Romans were the first scientific agriculturalists; their greatest men in the camp and in the city, and some of their most able writers, we know devoted themselves to this science. Of the surface of Italy the immense valley of the Po and the marshy plain of Terracino constitute capital features; and the embankments on the former as well as those on the Tiber, of many stadia in length, are striking memorials of the Roman art of embanking. Cato gives directions for opening the furrows of sown fields, and clearing them so as the water might find its way readily to the ditches; and for wet-bottomed lands he directs to make drains three feet broad at top, four feet deep, and one foot and a quarter wide at the bottom; to lay them with stones; or, if these cannot be got, with willow rods, placed contrary ways, or twigs tied together (Cap. 43). Columella directs both open and covered drains to be made sloping at the sides, and in addition to what Cato says respecting the water way of covered drains, directs to make the bottom narrow, and fit a rope made of twigs to it, pressing the rope firmly down, and putting some leaves, or pine branches over it, before throwing in the earth. Pliny says, the ropes may be made of straw, and that flint or gravel may be used to form the water-way, filling the excavation half full, or to within eighteen inches of the top.

To advert again for a moment to the east, where, if agriculture has been pursued with very little science, the importance of irrigation is at least well known and appreciated, Dr. Davy, in his account of the interior of Ceylon, describes an artificial mound or embankment, forming the lake or tank of Kandellé, which seems to rival the most celebrated works of this kind in history. This lake, wholly of artificial construction, is from three to four miles in circumference, and, like that of Minere, says he, skirted with green plains.

'The embankment by which the water is confined is a mile and one-third long. It extends nearly in a straight line, from a rocky hillock at one extremity, to a high ledge of rock at the other. Its perpendicular height may be about twenty feet; at its base it may be 150, or 200 feet, wide. Its face towards the lake is naked, sloped at an angle of about 45°, and composed of stones that rise one above the other like steps. The stones are of the same size nearly; from two to three feet long, about two high, and from one to two wide. They are of the same kind as the adjoining rock. It is, perhaps, worth remarking, that they have no sharp angles or asperities of surface; they have the appearance of quarried stones, rendered thus smooth by the action of the elements in long process of time. On the land-side the slope is very gentle, and the embankment is of gravel and earth. The stone face of the embankment is shaded by trees of great size; the other side is covered with large forest-trees and thick underwood, in most places impenetrable. Besides the great embankment, there is a small one detached from it about a quarter of a mile, and nearly at right angles to it, similarly constructed.

'The great outlet or sluice is constructed with much art and of vast strength; the channel is beneath a platform of masonry that projects into the lake about six feet beyond the line of the embankment, and is about twenty-four feet long. It is built of oblong stones, from five to seven feet long, well wrought and nicely adapted to each other without cement. The top of the platform is flat; it contains a small cylindrical well, communicating directly with the channel below, and in which the water, in passing, rises of course to the level of the lake.' The water, passing through the embankment, appears on the other side gushing out in a noble stream through two apertures

formed by a transverse mass of rock supported by three perpendicular masses. The transverse mass, which is now cracked in two, is about twelve or fourteen feet long, and four or five thick; and the other masses are of proportional size. The water rushing out in a considerable volume with great force, dashing amongst rocks beneath, in a deep gloomy shade produced by overhanging trees, makes altogether a very striking scene. The work itself has a simple grandeur about it which is seldom associated with art; it looks more like a natural phenomenon than the design of man.'

Agriculture was introduced by the Romans into every conquered province, and practised by the soldiers of their armies wherever they were stationary. Cæsar speaks of its being introduced into this country by colonies from Belgium, who cultivated the sea-coasts (about B.C. 150), while the natives were driven into the interior. Be this as it may, we have numerous traces of the embankments of Roman agriculture; and to that people is doubtless owing the general diffusion of the art in Britain. They perhaps first confined the channel of the Thames; and the embankments of Romney Marsh in Kent, as well as several noble mounds in the fenny part of Cambridgeshire, have been attributed to them.

But Holland and Flanders exhibit a scene of noble triumphs arising from this art. The embanked lands are here called polders, and consist of various areas reclaimed from the sea; the surface of which, once secured from the tide, becomes the most productive of earthy soils without any manure. The newly formed lands, before this embankment, are called schorres. They are flooded at every tide by the water of the sea, and are augmented by mire, pieces of wood, rushes, sea-weeds and other marine plants decayed and putrid, also by shells and fishy particles which the ebb always leaves behind in considerable quantity. This growing soil soon produces various plants and grasses, and improves daily. When such lands have acquired a crust or surface of black earth, three or four inches deep, they may be embanked and fallowed. Those are the most productive which have been deepened in their soil by the augmentations of the sea; and experience proves that, in the corners and hollows, where, from an obstructing boundary, the greatest quantity of mire has been deposited, the soil is doubly rich and good, and cannot be impoverished by the crops of many years. In some instances the embankments are made on the part of government, in others by companies or individuals, under a grant of a specific tenure (generally twenty-one years), rent free, or according to circumstances, at some moderate annual payment. The polder of Snaerkskirke, near Ostend, contains about 1300 acres. It is of late formation, and was overflowed by a creek with its minor branches every spring tide. By constructing two banks and a flood-gate, at the creek, the sea is excluded and the space subdivided by roads and laid out in fields, of thirteen acres each, surrounded by ditches. The bank is fifteen feet in height, thirty feet in the base, and ten feet across the top: the land which has been reclaimed by it was let for a sheep pasturage at 600 francs (£25) per annum, and was thrown up by the farmer as untenable. Upon being dried by this summary improvement, the lots of which are 100, of thirteen acres each, and were sold by auction at an average of 7000 francs (£291. 13*s*. 4*d*.), each would now bring nearly double that rate.

Another polder, called the Great Moor, recovered through the spirited exertions of M. Hyrwein, contains 2400 acres. Attempts had been made to recover it by the Spaniards in 1610, but without success. This marsh was seven feet below the level of the surrounding land; to drain it, therefore, it became necessary to surround the whole with a bank of eight feet in height, above the level of the enclosed ground, formed by the excavation of a fossée, fifteen feet wide and ten feet deep, which serves to conduct the water to the navigable canal;—to construct mills to throw the water over the bank into the fossée; and to intersect the interior by numerous drains, from eight to twelve feet wide, with a fall to the respective mills, to which they conduct all the rain water, and all the soakage water which oozes through the banks.

In North and South America embankments have been attempted in the neighbourhood of all the principal rivers as fast as settlers have accumulated; and some of the most interesting in the world are those of the Mississippi, extending from near its mouth at Balize, several hundred miles up the country; and protecting a most fruitful soil for sugar-canes.

The true mathematical principles of all these erections has been thus well stated by a contemporary:—'The pressure of still water against the sides of the vessel containing it being as its depth, it follows, that a bank of any material whatever, impervious to water, whose section is a right angled triangle, and the height of whose perpendicular side is equal to that of the water it is to dam in, will balance or resist this water, whatever may be the breadth of the surface of the latter; and, therefore, that as far as width or extent is concerned, it is just as easy to exclude the Atlantic Ocean as a lake or a river of a few yards in width.'

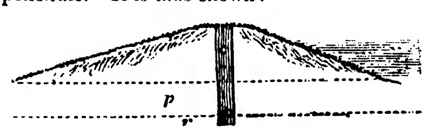
The modern embanking system of England, though at first, and when he was a private gentleman, discouraged as we have seen by CROMWELL (vide that article), was first patronised by him, afterwards as protector of the commonwealth: during which 425,000 acres of fen land were recovered in Lincolnshire, Cambridgeshire, and Kent, by colonel Vermuyden a Fleming, and an officer who had served immediately under the protector. The oldest embankment in England is unquestionably that of Romney Marsh, as to the construction of which, Dugdale remarks: 'that there is no testimony left to us from any record or historian.'

Embankments from the sea; from an inlet or bay of water; from the course of rivers; and from the floods common in fenny districts; are all clearly distinct operations. For the first, the earthen mound is in most general use and applies both to sea lands overflowed by every spring tide, and to alluvial plains inundated by every flood It is generally set out

in a direction parallel to the shore, or to the general turns of a river, but not to its minute windings: and it is placed farther from or nearer to the latter, according to the quantity of water in time of floods, the rapidity of the current from the declivity of the bed, the straight course of the stream, and the intended height of the bank. The two sides of such a mound are generally formed in different slopes. That towards the land is always the most abrupt, but can never be secure if more so than 45°; that towards the water varies from 45° to 15°; the power of the bank to resist the weight of the water, as well as to break its force when in motion, being inversely as its steepness. The power of water to lessen the gravity of bodies, or in other words, to loosen the surfaces over which they flow or stand, is also lessened in a similar ratio. The mound is thus exhibited:—

The construction of this embankment is very simple, and consists ordinarily of taking the earth by barrows or carts on rollers from the general surface to be protected, or from a collateral excavation, distant at least the width of the mound from its base line, and heaping it up in the proper form. The surface is then protected with turf, well rolled in order to bind it. When an excavation is made it serves the same purposes as an open drain in the earthen wall hereafter described; and similarly constructed sluices or valves are introduced on a larger scale. Sometimes also the interior water is drawn off by wind-mills, and thrown over the mound into the river. This is very common both in Cambridgeshire and Huntingdonshire, and might be greatly improved on by employing steam-engines for entire districts. Nature herself seems to dictate the mode imitated in Holland for preserving the upper part of their embankments. After the tides of the Po have left a mere strip of sand, it becomes quickly covered with vegetation in which the elymus arenarius, triticum junceum, and various species of juncus are conspicuous. As these and the debris of shells with which they are mingled decay, the fibrous roots of good grass flourish and soon occupy their place. The wicker-work embankments of Holland, studded with brush-wood, are clearly but an improvement upon this. The forming a bank of branches filled with sand and shells has also been suggested; and regularly constructed of frame timber, the section of which would resemble a trussed roof: each truss being joined in the direction of the bank of rafters, and the whole inside and surface stuck full by branches. To retain it firm, piles would require to be driven into the sand, to the upper parts of which would be attached the trusses. The height of such a barrier would require to be several feet above that of the highest spring-tides; and the more its width at base exceeded the proportion of that of an equilateral triangle the better. A more economical mode, and one, therefore, suited to a less extensive scale of operation, is to intersect a sandy shore in all directions, with common dead, or wicker-work hedges, formed by first driving a row of stakes six or eight feet into the ground, leaving their tops three or four feet above it, and then weaving among these stakes branches of trees, or the tops of hedges. *Encyclopædia Britannica, Supplement.*

Embankments of the above kind are the most common of any; they appear on all parts of the continent, and the eastern shore of England, richly covered with grass and often with trees. Their sections vary from a scalene triangle of ten feet in base, and three feet in height, as on the Forth near Stirling, and the Thames at Fulham, to a base of 100 feet, and a height of ten feet, as in the great bank near Wisbeach. Many of the great rivers of Germany and Holland are embanked in this way, when so far from the sea as to be out of the reach of the tide; as the Vistula at Marienwerder, the banks of which, near Dantzic, are above fifteen feet in height; the Oder, the Elbe, &c. Sometimes the earthen mound is assisted by the previous construction of a puddle ditch or clay wall of about four or five feet wide, in the centre of its highest part, and in the direction of its length. When this is well worked no water will penetrate it; and it may save the accumulation of materials in the bank itself. A great object here is to dig this ditch sufficiently deep to penetrate through the porous stratum, and come in contact with an argillaceous soil, or that which water will not penetrate. It is thus shown:—



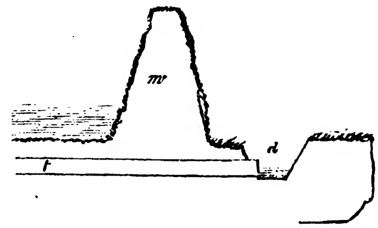

Here *c* is the clay wall, *p* the porous, and *r* the retentive, stratum. In particular situations, where it is an object to conceal the slope from the eye, the steepest part is placed next the water, as above; but this is certainly the weakest mode of protecting the land: by the difference of the weight of the triangle of water which would rest on the longer in comparison with that which rests on the shorter slope. A slope next the water of 45° or 50° is sometimes paved or causewayed with stones or timber. In Holland this pavement is often formed of planking or bricks; but in England generally with stones, and the mortar used is either cement which will set under water, or plants of moss firmly rammed between them. The objection to such banks is their expense, and their liability to be undermined invisibly by the admission of the water through crevices.

The concave *sea-wall* is a protected embankment formed against abrupt and earthy shores, and consists of a wall, varying in thickness, and the inclination of its surface, according to circumstances. M. Belidor, in his Traité de Hydraulique, professes to give the exact curve which the section of such a wall ought to have, in order to resist loose earth, and which is somewhat greater than where the earth behind the wall is supposed to be chiefly firm. Examples of such

walls occur in the Caledonian Canal; but the finest in the world are said to be those of granite which embank the Neva at St. Petersburgh.

One of the noblest attempts at a sea embankment in this, or perhaps any other country, was that commenced by W. A. Madocks, Esq. M. P., in 1807, to unite the counties of Merioneth and Cardigan by a mound across an estuary and embouchure of the Glasslyn. In 1802 this gentleman had constructed a wall or bank, by which he recovered 1800 acres of good alluvial soil from spring tides, and let them at from 30*s.* to 50*s.* per acre. He now contemplated the idea of gaining the whole bay or mouth of the stream, here two miles wide; extending to nearly 4000 acres of alluvial and sandy earth; and uniting, as we have said, the two counties. This would have rendered practicable a new line of road from Worcester along the top of his embankment, through the town of Tre Madoc, to the newly-formed harbour of Porthdynlleyn; by which forty miles of road would have been saved between Dublin and London, and fifty between Dublin and Bath. His first operation consisted in forming an immense bridge of floodgates in the solid rock of the shore, to admit the exit of the river; when the mound was commenced from both shores. The greater part of its materials were argillaceous rock broken into small pieces, mixed with clay and thrown down so as to take their own slope. An iron rail-way was formed along the work as it extended and led to the quarries and excavations. After three years' exertion the work was brought within fifty yards of meeting in the middle, but the rapidity of the influx and reflux of the tide here made the progress to its completion very difficult. To this, unfortunately, was now added pecuniary difficulties, which closed the undertaking, when it was calculated that £20,000 would have finished it. Sir Hugh Middleton, it is said, entertained a similar project as to this part of the country.

The *earthen-wall* of various inland districts is also to be considered as a species of embankment, although often erected by temporary occupiers of lands for the mere purpose of enclosing and subdividing them. It best applies to lands occasionally, but rarely overflown, or inundated; and is set out in a direction parallel to the river or shore. It is generally commenced from four to five feet wide, and built of turf with the grass side inwards, the middle being filled with earth; and finishing in about a foot or eighteen inches breadth at top, and at about five or six feet in height. As a collateral drainage inside such wall, and at the distance of three or four feet, a small open ditch is formed, out of which the water is let through the wall by tubes, or tunnels of boards, with a valve opening on their exterior extremity. When the flow of water from without approaches, it shuts the valve, which remains in this state till the flood subsides; when, the height of the water within being greater than that without, it opens the valve and flows off. These are common enough in the drier parts of the fenny districts of Lincolnshire and Cambridgeshire; and in Caernarvonshire 1800 acres were, in 1804, completely protected in this way on the estate of Tre Madoc already mentioned.




Here *w* is the wall, *d* the inner open drain, and *t* the tube or wooden tunnel through which its redundant waters are carried off.

*River* embankments are formed for protecting the existing course of their waters; for changing or accommodating that course to particular circumstances, and sometimes for altering or diverting it altogether.

Piers or guards are common modes of protecting the opposite bank when, in a crooked stream, or from some other cause, an obstacle accumulates. Mr. Marshall has discussed the proper kind of defences to be adopted in this case, in his Treatise on Landed Property: but they are to be used with great caution, and are only to be justified where the obstruction itself cannot, as Smeaton recommends it should, be removed from the opposite bank; or where, as is sometimes the case, it arises from an island of sand or gravel thrown out by the river near its middle, and which the interested parties perhaps cannot agree to remove. The case of buildings also being in danger may justify such a pier for immediate protection: if such breaches, however, are taken in time, a few loads of loose stones will generally effect a better remedy.

In forming a permanent land-guard of this kind, Mr. Marshall recommends, that the foundation be laid pretty deep, to guard against any accidental scoopings. The wall ought to be carried up dry, or without mortar, the stones being laid with their ends outward, their inner ends pointing to the same centre, like those of an arch, and to be backed with gravel or earth, rammed in firmly behind, as the facing is carried up. The coping or uppermost course of the stones is to be securely bound with thick tough sods, eight or ten inches deep, whose surfaces, when beaten down ought to lie even with that of the stone-work; and similar sods require to be laid, with a gently rising slope, until they unite smoothly with the natural turf of the land to be defended; so that the waters of floods, when they rise above the stone-work, may have no abruptness to lay hold of, but may pass away smoothly over the surface of the land, as they commonly do over smooth greensward, without injury. Finally, the stones are to be beaten forcibly into the bank, with a rammer, a mallet, or a small battering-ram, adapted to the purpose; thus rendering the whole compact and firm, to resist the current. Where vacancies or fissures still appear, long splinters of stone are to be driven in, as wedges, to increase the firmness, and prevent the current from tearing out an unguarded stone. It follows, in course, that the largest and longest of the stones ought to be used

where the greatest resistance is known to be required.

The sheath, or land-guard of loose stones, which this author also recommends, and which is the mode already mentioned as approved by Smeaton, is applicable where the river is confined in the part where it is required to be bent, by rocks or otherwise, to an unaltered channel; as it frequently is, in subalpine situations; as also where a deep pool occurs, in that part, in low water, so as to render it difficult to get a proper foundation for a pier. Where the foot of the injured bank is covered with a pool at low water, shelve off the brink of the bank, and shoot down loose stones from the top of it; suffering them to form their own slope, in the action of falling, and by the operation of succeeding floods, continuing to pour them down until the bank be secured, at least from minor floods, and then slope back the upper part, to give freedom to floods of higher magnitude.

Where, in flat countries, and surrounded by a valuable soil, a river is very circuitous, and much land may be gained or protected by a more rapid efflux of the water, its course must be either straightened or abandoned. The best plan in general is to find an entirely new bed or course for the river; otherwise, when it passes alternately through new soil, and through a part of its old bed, its action on surfaces which are so different in regard to induration ends, if great care is not taken, in holes and gulleys in the new bank, which require to be constantly filled up and repaired. The embankment used in straightening the course of rivers is always the mound, with a clay wall in the centre, varying in width according to the depth of the different parts of the old bed which it has to intersect, and the materials are obtained from excavations.

The hundred feet drain and other great outlets of the Bedford Level have been all constructed on the principle of straightening the water courses; which the late Mr. Rennie is said to have proposed to carry to a still greater extention in that district. One beautiful triumph of art in this neighbourhood, has at length been completed in the Eau Brink Cut, an entirely new outlet for the ancient Ouse. The bed of the old river was abandoned about five years ago, and it now presents the singular sight of being silted up, for nearly eight miles together, higher than the level of the adjacent lands. Tufts of vegetables appear all along, and in a few years, together with the whole neighbouring country being rescued from floods, this site will yield valuable cultivable soil.

Embankments that are designed to serve as the foundation of rivers are generally mounds without the clay section we have described.* The earth, in such cases, is allowed to take its own slope on both sides, which is commonly from 40° to 45°, and the width at top is regulated by that of the intended road or rail-way. The materials are excavated from ditches, or yielded by the adjacent surface on each side. In Holland such roads are generally bounded by trees which form an excellent guide at night to the eye of the traveller in flat countries. The first operation, where it can be accomplished, is to lay a foundation, three or four feet thick, of branches or faggots of copsewood, in order that the mound may sink in a body. Then, the direction of the mound being marked out by a line of poles, the barrowing or carting of the earth is carried on from end to end, until it reaches the proper height and width; leaving the slopes at the sides to form themselves, or assisting them by puddling them with water. See Engineering

EMBA'R, *v. a.* From em and bar. To shut; to enclose.

> Themselves for fear into his jaws to fall,
> He forced to castle strong to take their flight;
> Where fast *embarred* in mighty brazen wall,
> He has them now four years besieged to make them thrall. *Spenser.*
>
> Translating the mart unto Calais, he *embarred* all further trade for the future. *Bacon's Henry VII.*
>
> If this commerce betwixt heaven and earth were not
> *Embarred*, and all this traffic quite forgot,
> She, for whose loss we have lamented thus,
> Would work more fully and powerfully on us. *Donne.*
>
> In form of airy members fair *embarred*,
> His spirits pure were subject to our sight. *Fairfax.*

EMBA'RGO, *n. s.* Span. *embargar.* A prohibition to pass; in commerce, a stop put to trade.

> He knew that the subjects of Flanders drew so great commodity from the trade of England, as by *embargo* they would soon wax weary of Perkin. *Bacon's Henry VII.*
>
> After an *embargo* of our trading ships in the river of Bourdeaux, and other points of sovereign affront, there did succeed the action of Rheez. *Wotton.*
>
> Wit is its own remedy. Liberty and commerce bring it to its true standard. The only danger is the laying an *embargo*. The same thing happens here as in the case of trade; impositions and restrictions reduce it to a low ebb; for nothing is so advantageous to it as a free port. *Shaftesbury.*
>
> I was not much concerned, in my own particular, for the *embargo* which was laid upon it. *Dryden.*
>
> This is a very delicate subject for gentlemen to speak on; it lays an *embargo* on the house. No man can put himself into the ungracious state of opposing the repeal of afflicting taxes. Who can deny to the poor family the boon of getting their candles cheap? *Sheridan.*

*An* Embargo is an arrest on ships or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both for a limited time. The king may lay embargoes on ships, or employ those of his subjects, in time of danger, for the service and defence of the nation; but they must not be for the private advantage of a particular trader or company; and, therefore, a warrant to stay a single ship is no legal embargo. No inference can be made from embargoes which are only in time of war, and are a prohibition by advice of council, and not at prosecution of parties. If goods be laden on board, and after an embargo or restraint from the prince or state comes forth, and then the master of the ship breaks ground, or endeavours to sail, if any damage accrues he must be re-

sponsible for the same; the reason is, because his freight is due, and must be paid, even though the goods be seized as contraband.

EMBARK', *v. a.* & *n.* } Fr. *embarquer*; EMBARKA'TION. } Span. *embarcarse*, from *em*, i. e. *in* and *barca*, a small vessel.—Minsheu. To put or go on shipboard: and hence, to engage, or engage another in any affair.

The king had provided a good fleet, and had caused a body of 3000 foot to be *embarked* on those ships. *Clarendon.*

The French gentlemen were very solicitous for the *embarcation* of the army, and for the departure of the fleet. *Id.*

Of mankind, so numerous late,
All left, in one small bottom swam *embarked.*
*Milton.*

Straight to the ships Æneas took his way,
*Embarked* his men, and skimmed along the sea.
*Dryden's Æneid.*

I should with speed *embark*,
And with their embassy return to Greece.
*A. Phillips.*

*Embarked* in death, thy passage will be dark; and the shore, on which it will land thee, altogether strange and unknown. *Mason.*

But to our tale: the Donna Inez sent
Her son to Cadiz only to *embark*;
To stay there had not answered her intent.
*Byron.*

EMBAR'RASS, *v. a.* } Fr. *embarasser*, EMBAR'RASSMENT, *n. s.* } one of the compounds of bar, to stop. See BAR. To perplex; entangle; retard: hence, to distress.

I saw my friend a little *embarrassed*, and turned away. *Spectator.*

But here a mean
Observe, nor the large hound prefer, of size
Gigantic, he in the thick-woven covert
Painfully tugs, or in the thorny brake
Torn and *embarrassed* bleeds. *Somerville.*

Let your method be plain, that your hearers may run through it without *embarrassment*, and take a clear view of the whole. *Watts's Logick.*

To *embarrass* justice by a multiplicity of laws, or to hazard it by confidence in our judges, are, I grant, the opposite rocks on which legislative wisdom has ever split. *Goldsmith.*

Charles endeavoured to break this, and to *embarrass* Henry by another inroad of the Scots.
*Robertson. History of Scotland.*

And merely tend to show how greatly Love is
*Embarrassed* at first starting with a novice. *Byron.*

EM'BASE, *v. a.* From em and base. To make base; vitiate; depauperate; lower; impair.

Joy of my life, full oft for loving you
I bless my lot, that was so lucky placed;
But then the more your own mishap I rue,
That are so much by so mean love *embased.*
*Spenser.*

Clear and round dealing is the honour of man's nature, and mixture of falsehood is like alloy in coin of gold and silver, which may make the metal work the better, but it *embaseth* it: for these winding and crooked courses are the goings of the serpent; which goeth basely upon the belly and not upon the feet.
*Lord Bacon.*

I have no service or ignoble end, in my present labour, which may, on either side, restrain or *embase* the freedom of my poor judgment. *Wotton.*

I will rather chuse to wear a crown of thorns, than to exchange that of gold for one of lead, whose *embased* flexibleness shall be forced to bend.
*King Charles.*

A pleasure high, rational, and angelical; a pleasure *embased* with no appendent sting; but such a one as being honey in the mouth, never turns to gall or gravel in the belly. *South.*

EMBASS'ADOR, } See AMBASSADOR. Old EMBASS'ADRESS, } Fr. *embassadeur*. One sent EM'BASSAGE, } on a national or public EM'BASSY. } errand: hence any dignified or important messenger. The custom of our language is to write embassage and embassy, for the message, business, or commission; ambassador, or ambassadress, for the parties sent.

Fresh *embassy* and suits,
Nor from the state nor private friends, hereafter,
Will I lend ear to. *Shakspeare. Coriolanus.*

Nimble mischance, that art so light of foot,
Doth not thy *embassage* belong to me;
And am I last that know it? *Id. Richard III.*

When he was at Newcastle he sent a solemn *embassage* unto James king of Scotland, to treat and conclude a peace with him. *Bacon's Henry VII.*

Was it not for your sakes that he (Moses) thrust himself into the midst of that smoke and fire, which ye feared to see afar off? Was he not now gone, after so many sudden *embassages*, to be your leaguer with God? *Bp. Hall. Contemplations.*

He sends the angels on *embassies* with his decrees.
*Taylor.*

Mighty Jove's *embassador* appeared
With the same message. *Denham.*
Myself, my king's *embassador* will go. *Dryden.*
The peace polluted thus, a chosen band
He first commissions to the Latian land,
In threatening *embassy.* *Id. Æneid.*

A bird was made fly with such art to carry a written *embassage* among the ladies, that one might say, If a live bird, how taught? If dead, how made?
*Sidney.*

With fear the modest matron lifts her eyes,
And to the bright *embassadress* replies.
*Garth's Ovid.*

Nothing can be said to display the imperious arrogance of a base enemy, which does not describe with equal force and equal truth the contemptible figure of an abject *embassy* to that imperious power.
*Burke.*

EMBA'TTLE, *v. a.* & *n.* From battle. To range or be ranged in order or array of battle.

The English are *embattled*:
To horse! you gallant princes, strait to horse!
*Shakspeare.*

I could drive her from the ward of her reputation, her marriage-vow, and a thousand other her defences, which now are too strongly *embattled* against me.
*Id.*

The night
Is shiny, and they say we shall *embattle*
By the second hour of the morn. *Id.*
On their *embattled* ranks the waves return,
And overwhelm the war! *Milton's Paradise Lost.*
The prince who leads *embattled* thousands forth,
And with a nod commands the universe,
Knows not the language to make thee obey. *Howard.*
*Embattled* nations strive in vain
The hero's glory to restrain:
Streams armed with rocks, and mountains red with fire,
In vain against his force conspire. *Prior.*

A band undaunted, and inured to toils
Shall compass thee around, die at thy feet,
Or hew thy passage thro' the *embattled* foe,
And clear thy way to fame. *Somervile.*

They are gone,
Gone with the refluent wave into the deep—
A prince with half his people! Ancient towers,
And roofs *embattled* high, the gloomy scenes,
Where beauty oft and lettered worth consume
Life in the unproductive shades of death,
Fall prone. *Cowper.*

And, 'midst the horrors shrined of midnight storm
The fiend Oblivion eyes thee from afar,
Black with intolerable frowns her form,
Beckoning the *embattled* whirlwinds into war. *Beattie.*

EM'BAY, *v. a.* From *baigner* to bathe, Fr. To bathe; wet; or wash. Not used.

In her lap a little babe did play
His cruel sport;
For in her streaming blood he did *embay*
His little hands, and tender joints embrew. *Faerie Queene.*

Every sense the humour sweet *embay'd*,
And, slumbering soft, my heart did steal away. *Id.*

From *bay.* To inclose in a bay; to land-lock.

If that the Turkish fleet
Be not insheltered and *embayed*, they're drowned. *Shakspeare.*

EMBDEN, a considerable sea-port and fortified town of the kingdom of Hanover, situated on the river Embs or Ems, at its influx into the North Sea. It was long subject to Prussia; and, having a spacious harbour, has often been the object of patronage in regard to its trade. It was created a free port in 1751, and an East India trading company was established in 1769, but it did not flourish. Great benefit accrued to Embden, during the wars of the French revolution, from the neutrality of its flag. The harbour admits, at high water, vessels of thirteen feet of draught; and the roadstead offers a safe anchorage for the largest ships of war, little more than a mile from the town. Ship-building is carried on here; and a considerable export of oats, barley, butter, and cheese. The inhabitants are in general Calvinists. A canal is cut to Aurich, situated twelve miles to the south-west.

EMBEL'LISH, *v. a.* } Fr. *embellir*, from
EMBEL'LISHER, *n. s.* } Lat. *bellus*, fine, hand-
EMBEL'LISHMENT. } some. To adorn, beautify, or ornament. Embellishment is often used sarcastically for exaggeration or falsehood. See the extract from Atterbury.

How much more beauteous had the fountain been,
*Embellished* with her first created green;
Where crystal streams through living turf had run,
Contented with an urn of native stone. *Dryden's Juvenal.*

The names of the figures that *embellished* the discourses of those that understood the art of speaking, are not the art and skill of speaking well. *Locke.*

That which was once the most beautiful spot of Italy, covered with palaces, *embellished* by emperors, and celebrated by poets, has now nothing to shew but ruins. *Addison on Italy.*

Cultivate the wild licentious savage
With wisdom, discipline, and liberal arts,
The *embellishments* of life. *Id. Cato.*

Apparitions, visions, and intercourses of all kinds between the dead and the living, are the frequent and familiar *embellishments* of the legends of the Romish church. *Atterbury.*

Painting and sculpture are express imitations of visible objects; and where would be the charms of poetry, if divested of the imagery and *embellishments* which she borrows from rural scenes? *Percival.*

And as for you, my lady Squeamish,
Who reckon every touch a blemish,
If all the plants that can be found
*Embellishing* the scene around
Should droop and wither where they grow,
You would not feel at all—not you. *Cowper.*

EMBERIZA, in ornithology, a genus of birds belonging to the order of passeres. The bill is conical, and the mandibles recede from each other towards the base; the inferior mandible has the sides narrowed inwards; the upper one has a hard knob within. Species about seventy-seven. The most remarkable are:—

1. E. citrinella, the yellow-hammer, with a blackish tail, the two outward side-feathers marked on the inner edge with a sharp white spot. It is a bird of Europe, and visits the houses in winter; it builds its nest on the ground on meadows.

2. E. hortulana, the ortolan, has black wings; the first three feathers on the tail are white on the edges, the two lateral are black outwardly. The orbits are naked and yellow towards the inferior mandible. It feeds principally upon the panick grass; grows very fat; and is reckoned a great delicacy by epicures. These birds are found in several parts of Europe. In some parts it makes the nest in a low hedge; in others on the ground. The female lays four or five grayish eggs, and in general has two broods in a year. To fatten these birds for the table, they are placed in a chamber lightened by lanterns; where, not knowing the vicissitudes of day and night, they are constantly fed with oats and millet; and grow so fat, that they would certainly die if not killed in a critical minute. They are a mere lump of fat; of a most exquisite taste, but soon apt to satiate.

3. E. miliaris, the gray emberiza, is of a grayish color, spotted with black in the belly, and the orbits are reddish. It is the bunting of English authors, and a bird of Europe.

4. E. nivalis, the great pyed mountain finch of Ray, and the snow bird of Edwards, has white wings, but the outer edge of the prime feathers are black; the tail is black, with three white feathers on each side. These birds are called in Scotland snow-flakes, from their appearance in hard weather and in deep snows. They arrive in that season among the Cheviot hills, and in the Highlands, in large flocks. They appear in the Shetland islands; then in the Orkneys; and multitudes of them often fall, wearied with their flight, on vessels in the Pentland Frith. Their appearance is a certain fore-runner of hard weather, and storms of snow, being driven by the cold from their common retreats. They visit at that season all parts of the northern hemisphere, Prussia, Austria, and Siberia. They arrive very poor and return fat. In Austria they are caught and fed with millet, and, like the ortolan, grow excessively fat.

5. E. oryzivora, or the rice bunting, with the head and whole under side of the body black; hind part of the neck in some pale yellow, and in others white; coverts of the wings and primaries black, the last edged with white; part of the scapulars, lesser coverts of the wings, and rump white; back black, edged with dull yellow; tail of the same colors, and each feather sharply pointed; the legs are red. The head, upper part of the neck, and back, of the female, is yellowish-brown, spotted with black; the under part of a dull yellow; the sides thinly streaked with black. These birds are very numerous in the island of Cuba, where they commit great ravages among the early crops of rice, which precede those of Carolina. As soon as the crops of that province are more advanced, they quit Cuba, and pass over the sea in numerous flights, and appear in Carolina in September, while the rice is yet milky. Here they commit such devastations, that forty acres of that grain have been totally ruined by them in a short time. They arrive very lean, but soon grow so fat as to fly with difficulty. They continue in Carolina not much above three weeks, and retire when the rice begins to harden. They come into Rhode Island and New York in the end of April, or the second week in May, frequenting the borders of fields, and living on insects, &c., till the maize is ready, when they peck holes in the sides of the husks, which leaves room for the rain to get in, and effectually spoils the plants. They continue there during the summer, and breed; returning, as autumn approaches, to the southward. The males and females do not arrive together; the females come first. They are esteemed the most delicate birds of those parts; and the male is said to have a fine note.

6. E. schoeniclus, the reed sparrow, has a black head, a blackish-gray body, and a white spot on the quill-feathers. It inhabits marshy places most commonly among reeds. Its nest is very artificially contrived, being fastened to four reeds, and suspended by them like a hammock, more than three feet above the water; the cavity of the nest is deep but narrow; and the materials are bushes, fine bents and hairs. It lays four or five eggs of a bluish-white, marked with irregular purplish veins, especially on the larger end. It is a bird much admired for its song; and sings most in the night.

EM'BERS, *n. s. plur.* Sax. æmyrja; Goth. *emmyria*; Isl. *einmyria*; Swed. *askmeria*; Teut. *ammer*, from Sax. el, fire, and myria, ashes, cinders. Hot ashes.

Take hot *embers*, and put them about a bottle filled with new beer, almost to the very neck: let the bottle be well stopped, lest it fly out; and continue it, renewing the *embers* every day for the space of ten days.
*Bacon's Natural History.*

Good deeds in this life are coals raked up in *embers*, to make a fire next day. *Overbury.*

While thus heaven's highest counsels, by the low
Footsteps of their effects, he traced too well,
He tost his troubled eyes, *embers* that glow
Now with new rage, and wax too hot for hell.
*Crashaw.*

If the air will not permit,
Some still removed place will fit,
While glowing *embers* through the room
Teach light to counterfeit a gloom. *Milton.*

He said, and rose, as holy zeal inspires;
He rakes hot *embers*, and renews the fires.
*Dryden's Virgil.*

These scenes, their story not unknown
Arise, and make again your own;
Snatch from the ashes of your sires
The *embers* of your former fires. *Byron.*

EM'BER-DAYS, *n. s.*
EM'BERING, *n. s.*
EM'BER-WEEK.
Sax. ymbren. The first two substantives are synonymous. Of ember-week, Dr. Johnson says, the origin has been much controverted: some derive it from embers or ashes strewed by penitents on their heads; but Nelson decides in favor of Mareschal, who derives it from ymbren or embren a course or circumvolution. A week in which an ember-day falls.

The *ember-days* at the four seasons are the Wednesday, Friday, and Saturday after the first Sunday in Lent, the feast of Pentecost, September 14, December 14. *Common Prayer.*

For causes good so many ways,
Keep *emberings* well, and fasting days;
What law commands, we ought to obey,
For Friday, Saturn, and Wednesday. *Tusser*

Stated times appointed for fasting are Lent, and the four seasons of the year called *ember-weeks.*
*Ayliffe's Parergon.*

EMBER-WEEKS, by the canonists, are called quatuor anni tempora, the four cardinal seasons, on which the circle of the year turns; and hence Henshaw takes the word to have been formed, viz. by corruption, from tempora. They are now chiefly taken notice of, on account of the ordination of priests and deacons; because the canon appoints the Sundays next succeeding the ember weeks, for the solemn times of ordination; though the bishops may ordain on any Sunday or holiday.

EMBEZ'ZLE, *v. a.*
EMBEZ'ZLEMENT, *n. s.*
A corruption of *imbecile* Dr. Johnson says; but it seems better derived from Old Fr. *besler* or *embesler* to filch. To pilfer, steal; dishonestly appropriate: hence to squander or waste.

He had *embezzled* the king's treasure, and extorted money by way of loan from all men. *Hayward.*

When thou hast *embezzled* all thy store,
Where's all thy father left? *Dryden's Pers.*

EMBEZZLEMENT. For protecting masters against embezzlements by their clerks and servants, stat. 39 Geo. III. cap. 35, enacts, That servants or clerks, or persons employed for the purpose, or in the capacity of servants or clerks, who shall, by virtue of such employment, receive or take into their possession any money, goods, bond, bill, note, banker's draft, or other valuable security or effects, for, or in the name, or on account of, their master or employer, and who shall fraudulently embezzle, secrete, or make away with the same, or any part thereof; every such offender shall be deemed to have feloniously stolen the same from his master or employer, for whose use, or on whose account, the same was delivered to, or taken into the possession of such servant, clerk, or other person so employed, although such money, goods, bond, bills, notes

banker's drafts, or other valuable security, was or were no otherwise received into the possession of his or their servants, clerk, or other person so employed; and every such offender, his adviser, procurer, aider, or abettor, being thereof lawfully convicted or attainted, shall be liable to be transported to such part beyond the seas as his majesty, by and with the advice of his privy council, shall appoint, for any term not exceeding fourteen years, in the discretion of the court before whom such offender shall be convicted or adjudged.

EMBLA'ZE, *v. a.* } Fr. *blasonner*. See
EMBLAZ'ON, *v. a.* } BLAZE. To adorn with
EMBLAZ'ONRY, *n. s.* } glittering embellishments; to exhibit in glaring colors, and particularly with heraldic honors or ensigns.

Nor shall this blood be wiped from thy point,
But thou shalt wear it as a herald's coat,
T' *emblaze* the honour which thy master got.
*Shakspeare.*

We find Augustus, for some petty conquest *emblazoned* by the poets to the highest pitch.
*Hakewill on Providence.*

He from the glittering staff unfurled
The imperial ensign, streaming to the wind,
With gems and golden lustre rich *emblazed*,
Seraphick arms and trophies.
*Milton's Paradise Lost.*

Him round
A globe of fiery seraphim inclosed
With bright *emblazonry* and horrent arms. *Id.*

No weeping orphan saw his father's stores,
Our shrines irradiate, or *emblaze* the floors.
*Pope.*

Now high in air, the imperial standard waves,
*Emblazoned* rich with gold and glittering gems,
And like a sheet of fire through the dun gloom
Streaming meteorous. *Somerville.*

EM'BLEM, *n. s.* & *v. a.* } Fr. *embleme*; Ital.
EMBLEMAT'IC, *adj.* } Span. Portug. and
EMBLEMAT'ICAL, *adv.* } Lat. *emblema*; Gr.
EMBLEMAT'ICALLY, } εμβλημα, from the
EMBLEM'ATIST. } verb εμβαλλεσθαι, to insert. i. e. εν and βαλλω to throw. An ornament inserted or thrown into a piece of workmanship: to represent by emblems: emblematic and emblematical are representing pictorially, or by emblems; emblematist he who invents or uses them.

She had all the royal makings of a queen,
The rod, and bird of peace, and all such *emblems*,
Laid nobly on her. *Shakspeare. Henry VII.*

Poets can boast of nothing but a lean visage peering out of a seam-rent suit, the very *emblems* of beggary. *Ben Jonson.*

If you draw your beast in an *emblem*, shew a landscape of the country natural to the beast.
*Peacham on Drawing.*

Gentle Thames,
The mighty master's *emblem*, in whose face
Sate meekness, heightened with majestick grace.
*Denham.*

These fables are still maintained by symbolical writers, *emblematists*, and heralds.
*Browne's Vulgar Errours.*

Others have spoken *emblematically* and hieroglyphically, as the Egyptians; and the phœnix was the hieroglyphick of the sun. *Id.*

The primitive sight of elements doth fitly *emblem* that of opinions. *Glanville's Scepsis.*

The poets contribute to the explication of reverses purely *emblematical*, or when the persons are allegorical. *Addison.*

In the well framed models,
With *emblematick* skill and mystick order,
Thou shew'dst where towers on battlements should rise,
Where gates should open, or where walls should compass. *Prior.*

He took a great stone, and put it up under the oak, *emblematically* joining the two great elements of masonry. *Swift.*

Some when they die, die all; their mouldering clay,
Is but an *emblem* of their memories;
The space quite closes up through which they passed.
*Young.*

Sweet stream, that winds through yonder glade,
Apt *emblem* of a virtuous maid—
Silent and chaste she steals along,
Far from the world's gay busy throng. *Cowper.*

Now as these were *emblematic* exhibitions, they must have been as well adapted to the purposes of sculpture as of poetry, which indeed does not seem to have been uncommon, since one compartment of figures in the shield of Æneas represented the regions of Tartarus. *Darwin.*

Instructive *emblem* of this mortal state!
Where scenes as various every hour arise
In swift succession, which the hand of fate
Presents, then snatches from our wondering eyes.
*Beattie.*

And, bright around with quivering beams beset,
Her *emblem* sparkles o'er the minaret. *Byron.*

*An* EMBLEM, is a kind of painted ænigma, which, representing some obvious history, instructs us in some moral truth. See ÆNIGMA, &c Such is that very significant image of Scævola holding his hand in the fire; with the words, 'Agere et pati fortiter Romanum est, To do and suffer courageously is Roman.' The emblem is somewhat plainer than the ænigma. Gale defines emblem an ingenious picture, representing one thing to the eye, and another to the understanding. The Greeks also gave the name EMBLEMS, εμβληματα, from εμβαλλειν, to insert, to inlayed or Mosaic works, and even to all kinds of ornaments of vases, moveables, garments, &c. Cicero, reproaching Verres with having plundered statues and fine wrought works from the Sicilians, calls the ornaments fixed to them, and which on occasion might be separated, emblemata.

EMBLEMENTS, in English law, Fr. from emblaver, q. d semer en blé, to sow with wheat, is a term strictly signifying the profits of lands sown; though sometimes used more largely for any profits arising, and growing naturally from the ground; as grass, fruit, &c.

If a tenant for life sow the land, and die before harvest, his representatives shall have the emblements to compensate for the labor and expense of tilling, manuring, and sowing the lands, and also for the encouragement of husbandry; and not he in reversion. But if the tenant for years sow the land, and before severance the term expires, or the estate for life be determined by the tenant's own act, as by forfeiture for waste committed, or if a tenant during widowhood think proper to marry, then the lessor, or he in reversion shall have the emblements, and not

the lessee. The advantages of emblements are extended to the parochial clergy by 28 Hen. VIII. cap. 11.

All the cases of emblements turn upon the point of uncertainty; since the tenant could not possibly know when his landlord would determine his will, and therefore could make no provision against it; and having sown the land, which is for the good of the public, upon a reasonable presumption, the law will not suffer him to be a loser by it. But it is otherwise, and upon reason equally good, where the tenant himself determines the will; for in this case, the landlord shall have the profits of the land. Co. Litt. 55, 56.

Emblements are distinct from the real estate in the land, and are subject to many, though not all, the incidents attending personal chattels. They were devisable by testament before the statute of wills (Perk. sec. 412); and at the death of the owner, shall vest in his executor, and not his heir; they are forfeitable by outlawry in a personal action (Bro. Abr. tit. emblements, 21; 5 Rep. 116); and by the statute 11 Geo. II. cap. 19, though not by common law (1 Roll. Abr. 666), they may be distrained for rent arrear. Although the emblements are assets in the hands of the executor, are forfeitable upon outlawry, and distrainable for rent, they are not in other respects considered as personal chattels; and particularly, they are not the object of larceny, before they are severed from the ground. 3 Inst. 109.

Where a lord enters on his tenant for a forfeiture, he shall have the corn on the ground. 4 Rep. 21. Though if a feme copyholder for her widowhood sows the land, and before severance takes husband, so that her estate is determined, the lord shall have the emblements; yet if such a feme copyholder, durante viduitate, leases for one year according to custom, and the lessee sows the land, and afterwards the copyholder takes husband, the lessee shall have the corn. If a husband holds lands for life, in right of his wife, and sow the land, and after she dies before severance, he shall have the emblements. Dyer, 316. 1 Nels. Ab. 701. And where the wife has an estate for years, life, or in fee, and the husband sows the land, and dies, his executors shall have the corn. 1 Nels. 702. But if the husband and wife are joint-tenants, though the husband sow the land with corn, and dies before ripe, the wife, and not his executors, shall have the corn, she being the surviving joint-tenant. Co. Lit. 199.

A widow endowed with lands sown, shall have the emblements, and not the heir. 2 Inst. 81. And a tenant in dower may dispose of corn sown on the ground; or it may go to her executors, if she die before severance. 2 Inst. 80, 81.

If a tenant by statute-merchant sow the land, and before severance a casual profit happens, by which he is satisfied, yet he shall have the corn. Lands sown are delivered in execution upon an extent, the person to whom delivered shall have the corn on the ground. 2 Leon. 54. And judgment was given against a person, and then he sowed the land, and brought a writ of error to reverse the judgment, but it was affirmed; and adjudged that the recoverer shall have the corn. 2 Bulst. 213.

When a disseisor sows the land, and afterwards cuts the corn, but before it is carried away the disseisee enters, the disseisee shall have the corn. Dyer, 31. 11 Rep. 52. A person seised in fee of land dies, having a daughter, and his wife privement enseint with a son; the daughter enters and sows the land, and before severance of the corn, the son is born; in this case the daughter shall have the corn, her estate being lawful, and defeated by the act of God; and it is for the public good that the land should be sown.

If a man seised in fee-simple sows land, and then devises the land by will, and dies before severance; the devisee shall have the corn; and not the devisor's executors. Winch. 52. Cro. Eliz. 61. If a person devises his lands sown, and says nothing of the corn, the corn shall go with the land to the devisee: and when a man seised of land, in fee or in tail, sows it, and dies without will, it goes to the executor, and not to the heir. 10 Ed. IV. 1 b. 21 H. VI. 30 a. 37 H. VI. 35 b. A devisee for life dies, he in remainder shall have the emblements with the land.

EMBOD'Y, *v. a.* & *v. n.* Em and body. To put into or invest with a bodily, corporeal, or material shape; to draw together soldiers into a body; to be united in one body or mass.

> Eke enrooted deep must be that tree,
> Whose big *embodied* braunches shall not lie,
> Till they to heaven's hight forth stretched bee.
>
> *Spenser. Faerie Queene.*

> The local militia when not drawn out and *embodied*, shall be entitled to the same pay, clothing and allowances, as the regular militia are when not *embodied*; and when drawn out and *embodied*, shall be entitled to the same pay, clothing, and allowances, for themselves and families, as his majesty's other militia forces when drawn out and *embodied*.
>
> *Local Militia Act*, 48 *Geo. III.* c. 3.

> If there be no such thing as a *disembodied* spirit would not our Lord have shewn them their error? Instead of this he confirms them in their opinion, &c.
>
> *Clarke on Luke* xxiv. 37.

EMBOLD'EN, *v. a.* & *v. n.* To encourage or be encouraged; to strengthen or feel confirmed in resolution.

> Shall vain words have an end; or what *emboldeneth* thee that thou answerest? *Job* xvi. 3.

> Shall not the conscience of him which is weak be *emboldened* to eat those things which are offered to idols? 1 *Cor.* viii. 10.

> Yet nathemore by his bold hartie speach
> Could his blood-frozen hart *emboldened* bee,
> But through his boldness rather feare did reach.
>
> *Spenser. Faerie Queene.*

> Nothing *emboldens* sin so much as mercy.
>
> *Shakspeare.*

E'MBOLISM, *n. s.* Gr. εμβολισμος, from εν and βαλλω. See EMBLEM. Intercalation; insertion of days or years to produce regularity and equation of time.

> The civil constitutions of the year were after different manners in several nations; some using the sun's year, but in divers fashions; and some following the moon, finding out *embolisms* or equations, even to the

addition of whole months, to make all as even as they could. *Holder on Time.*

EMBOLISM, or EMBOLISMUS. As the Greeks made use of the lunar year, which is only 354 days, in order to bring it to the solar, which is 365 days, they had every two or three years an embolism, i. e. they added a fifteenth lunar month every second or third year, which additional month they called εμβολιμαιος, embolimœus, because inserted, or intercalated.

E'MBOLUS, *n. s.* Gr. εμβολος. Any thing inserted and acting in another, as the sucker in a pump.

Our members make a sort of an hydraulick engine, in which a chemical liquor, resembling blood, is driven through elastick channels by an *embolus*, like the heart. *Arbuthnot.*

EMBO'SOM, *v. a.* Em and bosom. To receive into the bosom, heart, or affections: hence to enclose; to shelter.

His house *embosomed* in the grove,
Sacred to social life and love. *Pope.*

EMBOSS', *v. a.* Fr. *emboister, embosquer;* Ital. *imboscare.* To enclose, as in a box or bush.

The knight his thrilliant spear again essayed
In his brass-plated body to *emboss.* *Spenser.*
And in the way, as she did weep and wail,
A knight her met, in mighty arms *embossed.*
*Id. Faerie Queene.*
Like that self-begotten bird
In the Arabian woods *embost.*
*Milton's Agonistes.*

EMBOSS', *v. a.* & *v. n.* } Fr. *embosser, bosse,*
EMBOSS'MENT. } a protuberance. To cause to rise or swell in tumors, or other projections: hence to sculpture in relief.

Oh, he is more mad
Than Telamon for his shield; the boar of Thessaly
Was never so *embost.* *Shakspeare.*

Timon hath made his everlasting mansion
Upon the beached verge of the salt flood;
Which once a-day, with his *embossed* froth,
The turbulent surge shall cover. *Id. Timon.*
Thou art a bile,
A plague sore, or *embossed* carbuncle,
In my corrupted blood. *Id. King Lear.*

I wish also, in the very middle, a fair mount, with three ascents and alleys, enough for four to walk abreast; which I would have to be perfect circles, without any bulwarks or *embossments.*
*Bacon's Essays.*

Botches and blains must all his flesh *emboss,*
And all his people. *Milton's Paradise Lost.*

When a deer is hard run and foams at the mouth, he is said to be *embost:* a dog also, when he is strained with hard running, especially upon hard ground, will have his knees swelled, and then he is said to be *embost,* from bosse, French, a tumour.
*Hanmer.*

All crowd in heaps, as at a night alarm
The bees drive out upon each other's backs,
T' *emboss* their hives in clusters.
*Dryden. Don Sebastian.*
Then o'er the lofty gate his art *embossed*
Androgeo's death, and offerings to his ghost.
*Id. Virgil.*

They are at a loss about the word pendentis; some fancy it expresses only the great *embossment* of the figure, others believe it hung off the helmet in alto relievo. *Addison on Italy.*

Averse they fly, or with rebellious aim
Chase him from thence: needless their impious deed,
The huntsman knows him by a thousand marks,
Black and *imbost.* *Somerville's Chase.*

While thus through all the stages thou hast pushed
Of treeship—first a seedling, hid in grass;
Then twig; then sapling; and, as century rolled
Slow after century, a giant-bulk
Of girth enormous, with moss-cushioned root
Upheaved above the soil, and sides *embossed*
With prominent wens globose—till at the last
The rottenness, which time is charged to inflict
On other mighty ones, found also thee. *Cowper.*

EMBOTHRIUM, in botany, a genus of the monogynia order, and tetrandria class of plants: CAL. none, COR. four linear-oblique petals; stamina four very short filaments; antheræ large, oblong, seated within the cavity of the petal. Pericarp a round unilocular follicle, sharpened at both ends: SEED four or five in number, egg-shaped, and compressed. Species eight elegant shrubs of New Holland and South America, bearing white and red flowers.

EMBO'TTLE, *v. a.* Fr. *bouteille.* To include in bottles; to bottle.

Stirom, firmest fruit
*Embottled,* long as Priamean Troy
Withstood the Greeks, endures. *Philips.*

EMBO'WEL, *v. a.* Old Fr. *emboullecz,* from bowel. To eviscerate; to deprive of the entrails; to exenterate.

*Embowelled* will I see thee by and by;
Till then, in blood, by noble Percy lye.
*Shakspeare.*
The schools,
*Embowelled* of their doctrine, have left off
The danger to itself. *Id.*
The roar
*Embowelled* with outrageous noise the air,
And all her entrails tore. *Milton's Paradise Lost.*
Fossils and minerals that the *embowelled* earth
Displays. *Philips.*

EMBOW'ER, *v. n.* & *v. a.* Em and bower. To receive or dwell within a bower; to build as a bower; to encircle as within a bower.

The small birds, in their wide boughs *embowering*
Chaunted their sundry tunes. *Spenser.*
—— On the mingling boughs they sit *embowered*
All the hot noon. *Thomson.*
Look where he comes—in this *embowered* alcove
Stand close concealed, and see a statue move:
Lips busy, and eyes fixed, foot falling slow,
Arms hanging idly down, hands clasped below,
Interpret to the marking eye distress,
Such as its symptoms can alone express. *Cowper.*

EMBRACE', *v. a., v. n.* & *n. s.* } Fr. *embras-*
EMBRACE'MENT, *n. s.* } *ser;* Ital. *ab-*
EMBRA'CER. } *bracciare;* Lat. *brachium,* the arm. To enclose, or take within the arms; to fondle; hence to seize with ardor, and to comprehend generally: as a neuter verb it is used by Shakspeare for to join in an embrace. As a noun embrace and embracement are alike, a fond clasping or enclosing within the arms; hence admission or reception; comprehension; enclosure.

And fyrst vppon the louely shall she smile,
And frendly on the cast her wandering eyes,
*Embrace* the in her armes, and for a whyle,
Put the and kepe the in a fooles paradise.
*Sir T. More.*

*Here, between the armies,*
*Let's drink together friendly, and embrace.*
*Shakspeare.*

Let me *embrace* with old Vicentio;
And wander we to see thy honest son,
Who will of thy arrival be full joyous. *Id.*

Fenton, Heaven give thee joy!
What cannot be eschewed, must be *embraced.*
*Id.*

I would freelier rejoice in that absence, wherein he won honour, than in the *embracements* of his bed, where he would shew most love. *Id. Coriolanus.*

I take it, your own business calls on you,
And you *embrace* the occasion to depart. *Id.*

The parts in man's body easily reparable, as spirits, blood, and flesh, die in the *embracements* of the parts hardly reparable, as bones, nerves, and membranes. *Bacon's Natural History.*

At first, her mother earth she holdeth dear,
And doth *embrace* the world, and worldly things.
*Davies.*

Nor can her wide *embracements* filled be. *Id.*

Yet are they the greatest *embracers* of pleasure of any other upon earth; and they esteem of pearls as pebbles, so they may satisfy their gust, in point of pleasure or revenge. *Howel.*

Thames, the most loved of all the ocean's sons
By his old sire, to his *embraces* runs. *Denham.*

Low at his feet a spacious plain is placed,
Between the mountain and the stream *embraced.*
*Id.*

There cherishing one another with dear, though chaste *embracements*, with sweet, though cold kisses, it might seem that Love was come to play him there without darts. *Sidney.*

These beasts, fighting with any man, stand upon their hinder feet, and so this did, being ready to give me a shrewd *embracement.* *Id.*

They who are represented by the wise virgins, *embraced* the profession of the Christian religion, as the foolish virgins also had done. *Tillotson.*

*Embrace* again, my sons! be foes no more;
Nor stain your country with her children's gore.
*Dryden.*

And I have unbiasedly *embraced* what, upon a fair inquiry, appeared so to me. If I must believe for myself, it is unavoidable that I must understand for myself. *Locke.*

If a man can be assured of any thing, without having examined, what is there that he may not *embrace* for truth? *Id.*

Can you e'er forget
The fond *embraces*, and repeated blessings
Which you drew from him in your last farewell?
*Addison.*

Eternity will not efface
Those records dear of transports past;
Thy image at our last *embrace*;
Ah! little thought we 'twas our last!
*Burns.*

EMBRA'SURE, *n. s.* Fr. *embrasure.* An aperture in the wall, through which the cannon is pointed; part of a battlement.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inside of the wall; its use being to give the greater play for the opening of the door or casement, or to admit the more light.

EMBR'AVE, *v. a.* From brave. To decorate; to embellish; to deck; to grace; to adorn. Not now in use.

*So, both agree their bodies to engrave;*
*The great earth's womb they open to the sky,*
*And, with sad cypress, seemly it embrave.*
*Faerie Queene.*

EM'BROCATE, *v. a.* } Fr. *embrocation*, from
EMBROCA'TION, *n. s.* } Gr. εμβρεχειν i. e. εν and βρεχειν, to damp or wet. To moisten with medicinal applications: the act of so doing; or the lotion is an embrocation.

I returned her a glass with oil of roses and vinegar, to *embrocate* her arm.
*Wiseman on Inflammation.*

We endeavoured to ease by discutient and emollient cataplasms, and *embrocations* of various sorts.
*Id. Surgery.*

*An* EMBROCATION, in surgery and pharmacy, is an external kind of remedy, which consists in an irrigation of the part affected, with some proper liquor, as oils, spirits, &c., by means of a woollen or linen cloth, or a sponge, dipped in the same.

EMBROI'DER, *v. a.* } Fr. *broder*, a com-
EMBROI'DERER, *n. s.* } pound of em and BROI-
EMBROI'DERY, *n. s.* } DER, which see. To border or decorate with ornaments; to diversify with raised needlework: embroiderer is the party executing this kind of work; and embroidery, the work performed: hence also, variegated colors generally.

Blue silk and purple, the work of the *embroiderer.*
*Eccles.*

Write,
In emerald tuffs, flowers purfled, blue and white,
Like saphire, pearl, in rich *embroidery*,
Buckled below fair knighthood's bending knee.
*Shakspeare.*

We see in needleworks and *embroideries*, it is more pleasing to have a lively work upon a sad and solemn ground, than to have a dark and melancholy work upon a lightsome ground: judge, therefore, of the pleasure of the heart by the pleasure of the eye.
*Bacon.*

Quality alone should only serve to make a shew in the *embroidered* part of the government; but ignorance though never so well born, should never be admitted to spoil the public business. *Saville.*

Such an accumulation of favours is like a kind of *embroidering*, or lifting of one favour upon another.
*Wotton.*

Envy rages as much in a sordid affected dress, as in all the silks and *embroideries* which the excess of the age and the folly of youth delight to be adorned with. *Clarendon.*

*Embroidered* so with flowers it had stood
That it became a garden of a wood. *Waller.*

Let no virgin be allowed to receive her lover, but in a suit of her own *embroidering.*
*Spectator*, No. 606.

If the natural *embroidery* of the meadows were helpt and improved by art, a man might make a pretty landskip of his own possessions. *Id.* No. 414.

Next these a youthful train their vows expressed,
With feathers crowned, with gay *embroidery* dressed.
*Pope.*

*Embroidered* purple clothes the golden beds,
This slave the floor, and that the table spreads.
*Id.*

How sweetly mutable yon orient hues,
As morn's fair hand her opening roses strews;
How bright, when Iris blending many a ray,
Binds in *embroidered* wreath the brow of day.
*Darwin.*

Embroidery is a work in gold, silver, or silk thread, wrought by the needle upon cloth, stuffs, or muslin, into various figures. In embroidering stuffs, the work is performed in a kind of loom; because the more the piece is stretched, the easier it is worked. As to muslin, they spread it upon a pattern ready designed; and sometimes, before it is stretched upon the pattern, it is starched to make it more easy to handle. Embroidery on the loom is less tedious than the other, in which, while they work flowers, all the threads of the muslin, both lengthways and breadthways, must be continually counted; but, on the other hand, this last is much richer in points, and susceptible of greater variety. Cloths too much milled are scarcely susceptible of this ornament, and in effect we seldom see them embroidered. The thinnest muslins are left for this purpose; and they are embroidered to the greatest perfection in Saxony. By stat. 22 Geo. II. c. 36, no foreign embroidery, or gold and silver brocade, shall be imported, upon pain of being forfeited and burnt, and penalty of £100 for each piece. No person shall sell, or expose to sale, any foreign embroidery, gold or silver thread, lace, fringe, brocade, or make up the same into any garment, on pain of having it forfeited and burnt, and penalty of £100. All such embroidery, &c., may be seized and burnt; and the mercer, &c., in whose custody it was found, shall forfeit £100.

EMBRO'IL, *v. a.* Fr. *brouiller*. To disturb; confuse; distract; throw into commotion; to involve in dissension or discord.

I had no passion, design, or preparation to *embroil* my kingdom in a civil war. *King Charles.*

Rumour next, and chance,
And tumult and confusion, all *embroiled*,
And discord with a thousand various mouths.
*Milton.*

When she found her venom spread so far,
The royal house *embroiled* in civil war,
Raised on her dusky wings she cleaves the skies.
*Dryden.*

Supposing a government wherein the person of the chief magistrate is not thus sacred; yet this doctrine of the lawfulness of resisting all unlawful exercises of his power, will not upon every slight occasion indanger him, or *embroil* the government; for where the injured party may be relieved, and his damages repaired by appeal to the law, there can be no pretence for force. *Locke.*

The Christian antiquities at Rome, though of a fresher date, are so *embroiled* with fable and legend, that one receives but little satisfaction.
*Addison on Italy.*

Embroil', *v. a.* Em and broil, to roast on the fire. See Broil.

That knowledge, for which we boldly attempt to rifle God's cabinet, should, like the coal from the altar, serve only to *embroil* and consume the sacrilegious invaders. *Decay of Piety.*

EMBROTHEL, *v. a.* Brothel, brodel. To enclose in a brothel.

Men, which chuse
Law practice for mere gain, boldly repute,
Worse than *embrotheled* strumpets prostitute.
*Donne.*

EMBRUN, an old town of France, situated on a steep rock near the Durance, in the department of the Upper Alps. It is walled, and has a citadel erected by Louis XIV. Embrun was formerly an archiepiscopal see, but is now united with that of Aix. Population 3150. Fifty-five miles south-west of Grenoble.

EM'BRYO, *n. s.*
Em'bryon, *n. s.* & *adj.*
Embryot'ic, *adj.*
} Fr. *embryon;* Span. *embrion;* Ital. *embrione;* Lat. *embryo*; Gr. εμβρυον, i.e. εν (γαστρος, the belly) βρυον, growing. Any thing in an imperfect but growing state, applied particularly to the human fœtus.

The bringing forth of living creatures may be accelerated, if the *embryo* ripeneth and perfecteth sooner.
*Bacon.*

The earth was formed, but in the womb as yet
Of waters, *embryon* immature involved
Appeared not. *Milton's Paradise Lost.*

—— Hot, cold, moist, and dry, four champions fierce
Strive here for mastery, and to battle bring
Their *embryon* atoms. *Id.*

An exclusion before conformation, before the birth can bear the name of the parent, or be so much as properly called an *embryon*.
*Browne's Vulgar Errours.*

And yet if it comes in question, whether a plant, that lies ready formed in the seed, have life; whether the *embryo* of an egg before incubation, or a man in a swoon without sense or motion, be alive, or no? it is easy to perceive, that a clear distinct settled idea does not always accompany the use of so known a word, as that of life is. *Locke.*

In that dark womb are the signs and rudiments of an *embryo* world *Burnet's Theory.*

When the crude *embryo* careful nature breeds,
See how she works, and how her work proceeds.
*Blackmore.*

The company little suspected what a noble work I had then in *embryo*. *Swift.*

While the promised fruit
Lies yet a little *embryo*, unperceived
Within its crimson folds. *Thomson's Spring.*

Some, bounded to a district-space,
Explore at large man's infant race,
To mark the *embryotic* trace
Of rustic Bard;
And careful note each opening grace,
A guide and guard. *Burns.*

Sylphs! as you hover on ethereal wing,
Brood the green children of parturient spring!—
Where in their bursting cells my *embryons* rest,
I charge you, guard the vegetable nest. *Darwin.*

Nor yet for the ravage of winter I mourn;
Kind Nature the *embryo* blossom will save:
But when shall spring visit the mouldering urn?
O when shall it dawn on the night of the grave
*Beattie.*

It has the earliest intelligence of intended preferments that will reflect honour on the patrons; and *embryo* promotions of modest gentlemen, who know nothing of the matter themselves. *Sheridan.*

EME, *n. s.* Sax. eame. Uncle. Now obsolete. See Eame.

Whilst they were young, Cassibelan their *eme*,
Was by the people chosen in their stead;
Who on him took the royal diadem,
And goodly well it long time governed.

**EMEND,'** *v. a.* French, *emendation;* Ialian, *emendatione;* Latin, *emendatio.* See AMEND. To correct.
**EMENDA'TION,** *n. s.*
**EMENDA'TOR,** *n. s.*
**EMEN'DATORY,** *adj.*

Emendation is the correction made; and emendator, he who makes it; emendatory, is corrective.

> Have us excused, that we no better do,
> Another time to *emende* it if we can.
> *Mystery of Candlemas Day.*

The Roman *emendators* of Gratian themselves know not how to trust it. *Bp. Cosin.*

The essence and relation of any thing in being, is fitted beyond any *emendation,* for its action and use; and shews it to proceed from a mind of the highest understanding. *Grew.*

He had, what is the first requisite to *emendatory* criticism, that intuition by which the Poet's intention is immediately discovered. *Johnson.*

EM'ERALD, *n. s.* Fr. *emeraude;* Ital. *smeraldo;* Span. and Port. *esmeralda;* Teut. and Belg. *schmaragd;* Lat. *smaragdus;* Arab. *zmarad;* Armen. *zmaragthos;* Gr. *σμαραγδος,* from the verb *σμαρασσω,* luceo, to shine. A precious stone of considerable beauty and value.

Do you not see the grasses how in colour they excel the *emerald?* *Sidney.*

The *emerald* is a bright grass green; it is found in fissures of rocks, along with copper ores. *Woodward on Fossils.*

> Nor deeper verdure dies the robe of Spring,
> When first she gives it to the southern gale,
> Than the green *emerald* shows. *Thomson's Summer.*

The *emerald* is evidently the same with the ancient smaragdus; and, in its most perfect state, is perhaps the most beautiful of all the gems. The rough *emerald* is usually of a very bright and naturally polished surface, and is ever of a pure and beautiful green, without the admixture of any other colour. The oriental *emerald* is of the hardness of the saphire and ruby, and is second only to the diamond in lustre and brightness. *Hill on Fossils.*

> With verdant light the modest *emeralds* glow,
> Blue sapphires glare, and rubies blush below;
> Light piers of lazuli the dome surround,
> And pictured mochoes tesselate the ground.
> *Darwin.*

> In noon's bright blaze thy vermil vest unfold,
> And wave thy *emerald* banner starred with gold. *Id.*

> Throned in her *emerald*-car, see Spring appear!
> (As fancy wills the landscape starts to view)
> Her *emerald*-car the youthful Zephyrs bear,
> Fanning her bosom with their pinions blue.
> *Beattie.*

> Light be the turf of thy tomb!
> May its verdure like *emeralds* be:
> There should not be the shadow of gloom,
> In ought that reminds us of thee. *Byron.*

EMERALD. This genus contains two species, the prismatic and rhomboidal.

Prismatic emerald, Euclase of Haüy. Its colors are green, of various shades, and sometimes sky blue. It is found only crystallised. The primitive form is a prism of 133° 24'. Lustre splendent. Cleavage perfect in the direction of the smaller diagonals of the prism. Transparent. Refracts double. Harder than quartz, but softer than topaz. Easily frangible. Specific gravity 2·9 to 3·3. Loses transparency, and then melts before the blow-pipe. Its constituents are 35 to 36 silica, 18 to 19 alumina, 14 to 15 glucina, 2 to 3 iron, and 27 to 31 loss. The last is chiefly water, and in some measure alkali. Found in Peru and Brasil. It is a beautiful mineral, but two brittle for jewellery.

Rhomboidal emerald, of which there are two sub-species, the precious emerald and the beryl. Precious emerald is well characterised by its green color, of various depths. It is generally crystallised. The primitive form is an equiangular six-sided prism, on which various truncations are found. Lustre splendent. Cleavage straight and four-fold. Transparent. Moderate double refraction. Nearly as hard as topaz. Specific gravity 2·6 to 2·77. Heated to a moderate degree, it becomes of a blue color, but recovers its tint on cooling. At a high heat, it fuses into a white vesicular glass. Its constituents are silica 64·5, alumina 16, glucina 13, oxide of chrome 3·25, lime 1·6, water 2. It occurs in drusy cavities, along with iron pyrites, calcareous spar, and quartz, in veins that traverse clay-slate. The most beautiful emeralds come from Peru. As a gem it is valued next to the ruby. The emerald is perhaps the most beautiful of all the gems; and according to Wallerius, when heated in the fire, changes its color to a deep blue, and becomes phosphorescent; but recovers its green when cold. When pulverised it has a white appearance, and with borax melts to a very thin and colorless glass. It becomes electric by being rubbed, and some have the property of the tourmalin, viz. of being electrified by heat, and in that state attracting ashes or other light substances; though after having attracted the ashes, they retain them without any signs of repulsion. Pliny mentions twelve different kinds of these precious stones; though it appears, from the vast size of some of them, that they must have been only certain kinds of green spar, or other green stone, which at that time went under the name of emerald among the ancients. Theophrastus, however, mentions one four cubits long and three broad likewise an obelisk composed of only four emeralds, the whole length being forty cubits, and the breadth from four to two.

EMERGE,' *v. n.* Lat. *emergo,* from *e* privative and *mergo,* to plunge. To rise out of a fluid; to issue; proceed; to rise into view, and hence out of obscurity.
EMERG'ENCE, *n. s.*
EMERG'ENCY,
EMERG'ENT, *adj.*
EMER'SION, *n. s.*

Emergence and emergency are the act of rising in this way; also (metaphorically) any sudden casualty or occurrence. Emersion is confined to the rising out of a fluid or out of obscurity; as in its particular application to the re-appearance of a star. Emergent is proceeding or issuing forth, from something; and is sometimes used for sudden, casual, unexpected.

The man that is once hated, both his good and his evil deeds oppress him; he is not easily *emergent.* *Ben Jonson.*

All the lords declared, that, upon any *emergent* occasion, they would mount their servants upon their horses. *Clarendon.*

> Immediately the mountains huge appear
> *Emergent,* and their broad bare backs upheave
> Into the clouds. *Milton*

Most of our rarities have been found out by casual *emergency*, and have been the works of time and chance rather than of philosophy. *Glanville's Scepsis.*

We have read of a tyrant, who tried to prevent the *emergence* of murdered bodies. *Browne's Vulgar Errours.*

The time was in the heliacal *emersion*, when it becomes at greatest distance from the sun. *Id.*

The *emergency* of colours, upon coalition of the particles of such bodies, as were neither of them of the colour of that mixture whereof they are ingredients, is very well worth our attentive observation. *Boyle on Colours.*

They *emerged*, to the upper part of the spirit of wine, as much of them as lay immersed in the spirit. *Boyle.*

Thetis, not unmindful of her son,
*Emerging* from the deep, to beg her boon,
Pursued their track. *Dryden's Homer.*

The stoics held a fatality, and a fixed unalterable course of events; but then they held also, that they fell out by a necessity *emergent* from, and inherent in, the things themselves, which God himself could not alter. *South.*

The mountains *emerged* and became dry land again, when the waters retired. *Burnet's Theory.*

In any case of *emergency*, he would employ the whole wealth of his empire, which he had thus amassed together in his subterraneous exchequer. *Addison's Freeholder.*

If the prism was turned about its axis that way, which made the rays *emerge* more obliquely out of the second refracting surface of the prism, the image soon became an inch or two longer, or more. *Newton's Opticks.*

The white colour of all refracted light, at its very first *emergence*, where it appears as white as before its incidence, is compounded of various colours. *Id.*

When, from dewy shade *emerging* bright,
Aurora streaks the sky with orient light,
Let each deplore his dead. *Pope's Odyssey.*

Then from ancient gloom *emerged*
A rising world. *Thomson's Summer.*

In this situation of Europe, Scotland, which had hitherto wasted her strength between France and England, *emerged* from her obscurity, took her station in the system, and began to have some influence upon the fate of distant nations. *Robertson. History of Scotland.*

As one, who, long detained on foreign shores,
Pants to return, and when he sees afar
His country's weather-bleached, and battered rocks,
From the green wave *emerging*, darts an eye
Radiant with joy towards the happy land;
So I with animated hopes behold. *Cowper.*

—Hither, *emerging* from yon orient skies,
Botanic Goddess! bend thy radiant eyes;
O'er these soft scenes assume thy gentle reign
Pomona, Ceres, Flora, in thy train. *Darwin.*

From silent mountains, straight, with startling sound,
Torrents are hurled; green hills *emerge*; and lo,
The trees with foliage, cliffs with flowers are crowned;
Pure rills through vales of verdure warbling go;
And wonder, love, and joy, the peasant's heart o'erflow. *Beattie.*

Emersion, in astronomy, is used when the sun, moon, or other planet, begins to re-appear, after its having been eclipsed, or hid by the interposition of the moon, earth, or other body. The difference of longitude is sometimes found by observing the immersions and emersions of the first of Jupiter's satellites. The immersions are observed from the time of Jupiter's being in conjunction with the sun to his opposition; and the emersion from the opposition to the conjunction; which two intervals are usually six months each and divide the year between them.

Emersion, in physics, the rising of any solid above the surface of a fluid specifically heavier than itself, into which it had been violently immerged or thrust. It is one of the known laws of hydrostatics, that a lighter solid being forced down into a heavier fluid, immediately endeavours to emerge; and that with a force equal to the excess of weight and quantity of the fluid above that of an equal bulk of the solid. Thus, if a solid be immerged in a fluid of double its specific gravity, it will emerge again till half its bulk or body be above the surface of the fluid.

E'MERODS, *n. s.* } Corrupted in pronun-
E'meroids. } ciation from hemorrhoids, αιμορροιδες. Painful swellings of the hemorrhoidal veins; piles.

He destroyed them, and smote them with *emerods*. *1 Sam.*

EMERSON (William), a celebrated mathematician, was born in 1701, at Hurworth, near Darlington. In the earlier part of his life he attempted to teach a few scholars; but he soon discontinued the pursuit; and, satisfied with a moderate competence left him by his parents, devoted himself to a studious retirement. Towards the close of 1781 he disposed of the whole of his mathematical library to a bookseller at York; and on May 20th, 1782, died of a lingering and painful disorder at his native village, aged eighty-one. Mr. Emerson was a recluse of singular habits and temper; coarse, proud, and affecting frivolous singularities. To his mathematical acquirements he added considerable skill in the science of music, but was a poor performer. He wrote, 1. The Doctrine of Fluxions; 2. The Projection of the Sphere, orthographic, stereographic, and gnomonical; 3. The Elements of Trigonometry; 4. The Principles of Mechanics; 5. A Treatise of Navigation on the Seas; 6. A Treatise of Algebra, in two books; 7. The Arithmetic of Infinites, and the differential method, illustrated by examples; 8. Mechanics, or the Doctrine of Motion; 9. The elements of Optics, in four books; 10. A System of Astronomy; 11. The Laws of Centripetal and Centrifugal Force; 12. The Mathematical Principles of Geography; 13. Cyclomathesis; or an easy Introduction to the several branches of Mathematics; 14. A short Comment on Sir Isaac Newton's Principia; to which is added, A Defence of Sir Isaac against the Objections that have been made to several parts of his Works.

EMERY, a sub-species of rhomboidal corundum. Its color is intermediate between grayish-black and bluish-gray. It occurs massive and disseminated, and also in granular concretions. Lustre glittering and adamantine. Fracture fine-grained uneven. Translucent on the edges. So very hard as to scratch topaz. Specific gravity 4·0. Its constituents are 86 alumina, 3 silica, 4 iron, and 7 loss. In Saxony it occurs in beds of talc and steatite. It occurs abundantly in the Isle of Naxos, and also at Smyrna. It is used for polishing hard minerals and metals Its fine powder is obtained by trituration and

elutriation. It is also sometimes very red, and then usually contains veins of gold. Dr. Lewis supposes that some kinds of emery may contain platina. For its use in various manufactures, emery is ground in mills, and the powder separated into parcels of different degrees of fineness by washing; distinguished into first, second, and third qualities: the first being that which remains longest suspended in water, the others, such as sink sooner in the same liquor, which is poured from them, with the finer kind swimming in it and afterwards allowed to settle. Emery thus prepared is of great use to different artificers in polishing and burnishing iron and steel works, marble, cutting and scalloping glass, &c.

EMERY (John), an actor of eminence, was born at Sunderland, in the palatinate of Durham, Dec. 22, 1777, and educated at Ecclesfield in Yorkshire, where he acquired that knowledge of the provincial dialect which afterwards contributed so much to his celebrity. In the unsophisticated rustic or the stupid dolt he was excellent; while in some parts, written purposely for him, such as Tyke in the School of Reform, and Giles in the Miller's Maid, his acting was truly terrific and appalling. The portraying of rough nature, fine simplicity, and strong passion, was his forte. In private life he was much esteemed; he died in January, 1822.

EMET'IC, *n. s.*
EMET'ICAL, *adj.*
EMET'ICALLY, *adv.*
Gr. εμετικος, from the verb εμεω, to throw forth; to vomit. A medicine provoking vomits.

EMETICS. See MEDICINE. Emetics may be arranged under those derived from the vegetable, and those from the mineral kingdom. From the vegetable kingdom are numbered ipecacuanha, scilla maritima, anthemis nobilis, sinapis alba, asarum Europæum, nicotiana tabacum. From the mineral kingdom, antimony, the sulphates of zinc and copper, and the subacetate of copper. To these may be added ammonia, its hydro-sulphuret, and the tartar emetic. The preparations of mercury are seldom employed as emetics. The sulphate, or turpeth mineral, has been chiefly used, but its operation is violent.

EMETIN, in chemistry, the vegetable basis of ipecacuan root which is thus procured. Digest ipecacuan root, first in ether and then in alcohol. Evaporate the alcoholic infusion to dryness, redissolve in water, and drop in acetate of lead. Wash the precipitate, and then, diffusing it in water, decompose by a current of sulphureted hydrogen gas. Sulphuret of lead falls to the bottom, and the emetin remains in solution. By evaporating the water this substance is obtained pure.

Emetin forms transparent brownish-red scales. It has no smell, but a bitter acrid taste. At a heat somewhat above that of boiling water, it is resolved into carbonic acid, oil, and vinegar. It is soluble both in water and alcohol. It is precipitated by protonitrate of mercury and corrosive sublimate. Half a grain of emetin acts as a powerful emetic, followed by sleep; six grains vomit violently, and produce stupor and death.

EMICA'TION, *n. s.* Lat. *emicatio*. Sparkling; flying off in small particles, as sprightly liquors.



Iron, in aqua fortis, will fall into ebullition, with noise and *emication*, as also a crass and fumid exhalation. *Browne.*

EMIC'TION, *n. s.* From Latin, *emictum*. Urine; what is voided by the urinary passages.

Gravel and stone grind away the flesh, and effuse the blood apparent in a sanguine *emiction*. *Harvey on Consumptions.*

EM'IGRATE, *v. a.* & *adj.*
EM'IGRANT, *n. s*
EM'IGRATION.
Latin, *emigro*, from *e* & *migro*, to wander. To remove from a place; generally applied to removing from one country to another. An emigrant is he who thus removes.

We find the originals of many kingdoms either by victories, or by *emigrations*, or intestine commotions. *Hale.*

These *emigrants* were to receive pay and subsistence for some years at the public expense. *Robertson.*

The gnats of this country are produced in greater numbers in some years than others, and are then seen in swarms for many evenings near the lakes or rivers whence they arise; and, I suppose, *emigrate* to upland situations, where fewer of them are produced. *Darwin.*

EMIGRATION. This is a topic connected with another very important branch of political economy, that of POPULATION, upon which we are not disposed to express all our opinions until we can support them with that degree of proof of which we consider them to be capable. At present we assume the popular basis of this interesting subject, that population, in all the settled countries of Europe, presses hard upon the means of subsistence; so hard that, with all the local attachments and sympathies of mankind, thousands at this moment are seeking in our own country, the most eligible mode of leaving it for distant shores, and hoping to find, in the cultivation of the very wilds of nature, more of certain subsistence and ultimate comfort, than in their native and still beloved country.

But is this, in itself, an evil? We mean, the propensity of mankind to jostle one another (we know of no equally intelligible mode of expressing what we would convey) in old countries; and thus producing by re-action the exploration and settlement of new ones? We think not. While it may arise immediately from some errors that are reproachful to human nature and human governments, it may also be a part of the wise dispensations of Providence to accomplish the further peopling of the earth, and the more extended happiness of man.

We therefore regard emigration as among the best of expedients in the hands of a *wise government*, for correcting the ordinary surplusage of population; and we would, with all deference, submit that the discreet application of such an expedient, in a country like our own, is peculiarly called for at the present time. What others have regarded as 'a great and radical evil,' afflicting society with 'the want of food,' we would endeavour to exhibit as a principle of expansive good, designed to stimulate the rulers of a country to more enlarged ideas of the government of it; particularly as designed to teach the science of governing such a country

as our own in *times of peace*: and ultimately to impress upon us this great truth, that mankind at large, to be governed happily, must and will finally be governed but as the various branches of one universal family.

We reason in this way, with regard to mankind, considered as a whole. The thinly-peopled parts of the earth have always hitherto been more in number and wider in extent than what are called the thickly-peopled parts. If you have one China, for instance, upon the earth, you have a Russia, and a Turkey in Europe and in Asia, over the face of which all the existing inhabitants of China might be distributed, and travellers in half a century would scarcely perceive a difference in those statistical and moral wastes. At home, if we have one Ireland we have two Canadas (to say nothing of other promising appendages of our empire); and, if these hints of what might be done by way of equalising population and subsistence, be thought speculative, look, we say, at an *accomplished* and matter-of-fact proof, that where any sufficient portion of mankind is duly regarded as one family, they will always find a portion of the one earth we inhabit, abundantly sufficient to maintain them. Look at *our children*, the United States of North America. We were of one family: some of our children we persecuted for their religion, and they went thither; others of them were discontented, or behaved ill at home, and they followed, or were sent after them; at last a general family quarrel took place between the mother country and these distant establishments, and they have now therefore settled themselves as an independent family. But still neither they nor we can blot out *the fact* from history (why should either wish to do it?) that they were and *are* our children; and if we could for a moment admit that we were at this time a decayed and exhausted people at home, we should insist that these new and rising states of the west present an indubitable proof that those parts of the earth which Providence has placed under one control are wide enough for one family. Looking at them and ourselves as branches but of one system of public polity, they are multiplying faster than was ever *recorded* in history, while they are receiving annually large accessions of population from our shores, and those of Europe generally; and have as yet not explored several thousands of miles of the geographical territory they claim, and are capable of defending. We might further advert to old and decayed Spain—ready and worthy to perish as a nation, on one side of the Atlantic, and Mexico, Peru, Colombia, and the central states of America, her children, on the other: or to Portugal, whence, in point of fact, the king and government have emigrated before the people (and they are not likely to have preferred the worse country) on the right hand and Brasil on the left. If all this has been done, we say, with the earth, in our own time and memory almost, when mankind have been almost universally quarrelling, and much of it in direct connexion with these quarrels, what might not be done if men could learn to agree?

In fact, upon this subject, we must be allowed to quote an anecdote of the life of the late bishop Watson. Being told of the tendency and general arguments of a certain celebrated work on the alarming increase of our population: 'I laid it down,' he says, 'for even admitting his theory that population has a tendency to increase in particular circumstances beyond the means of subsistence; as God and nature *say*, 'Increase,' it is our clear and indisputable duty not to attempt to stop the one, but TO AUGMENT THE OTHER.' We contend, therefore, that the history and experience of the last two centuries, go to prove that the resources of mankind, considered as a whole, are *unbounded by any calculation* we can make, or that is ever likely to become practicable; or that our duty to our own people, and those of all other countries, as far as we have power, is not to check population, but to increase the means and happiness of our fellow-men: we cannot check population in the virtuous and 'honorable' method in which God has appointed it to increase, without increasing vice, and with vice, misery. While we cannot earnestly desire and industriously endeavour to promote and economise the means and happiness of mankind, without increasing virtue, teaching and practising religion in its best forms; leading others, and being led ourselves, from suffering man to a wise and benevolent God.

It will not here be out of place to review briefly what the modern investigation of the doctrine of population seems to have established.

1. Then it would appear to be proved by the united evidence of ancient history and recent discovery; it is forced upon our belief by all that we hear, or read, or see, or feel; that it is the uniform tendency of population in every known stage of society, from the earliest to the most advanced, to press against the actual or available supply of food.

2. Population, even while it presses against the existing provision of subsistence, has a uniform tendency to keep within the powers of the soil, if the natural order of things is not counteracted by human neglect or impolicy. Because before the productive powers of any tolerably fertile soil can be nearly exhausted, the people in the regular progress of social communities must have become colonial, commercial, manufacturing; must be collected into large towns and cities; must require soldiers, mariners, servants, &c.; in short, must have reached that state of society in which population does not increase with rapidity.

3. During the alternate progress of population and subsistence, the pressure of the former by a previous increase of people is necessary to stimulate the community to a further production of food: so that the pressure of population against the means of subsistence, instead of being the cause of most of the miseries of human life, is in well-governed states the cause of all public happiness, industry, and prosperity. The pressure against subsistence ensures industry, industry ensures increase of produce, increase of produce again encourages population; and these alternate oscillations of the balance are calculated not to disjoin, but to unite and strengthen the structure of society. If with this

last view of the beneficial effects of the principle of population as inherent in our nature, we connect the indubitable facts of the large colonies that accrue to all extensively civilised and commercial people; and the existing state and capabilities of our own country in this respect, before alluded to, the modern doctrine of population, admitting all its facts with regard to rapid increase, stimulates us to gratitude and exertion, not to alarm and despair.

It should stimulate us to avail ourselves of our colonies: to regard the whole territorial dominions of Great Britain and its dependencies as one integral government, one common soil. Let the government so regard it; and, removing all foreign and inequitable laws in the colonies, and approximating them as much as possible to the institution of the mother country in their entire condition, encourage respectable, and give facilities of removal to poorer emigrants. In fact, so complete an illustration of our views of this important topic is presented in the existing situation of Ireland on the one hand, and our dominions in North America on the other, that we shall content ourselves in this paper with abridging a luminous statement of the facts on this subject which has lately appeared in the Edinburgh Review.

Ireland then, at this moment (1827), has an alarming portion of its people *habitually* involved in the most squalid and abject poverty. The witnesses examined by the late committees of the houses of lords and commons on the state of Ireland, all concur in representing the population as excessive, and the condition of the poor as wretched in the extreme. Above 6,000,000 of peasantry are hutted over the face of the country. Their cabins are not superior, perhaps not equal, to the wigwams of the American Indians; they are destitute of chimneys, and of any thing that can be called furniture; many families are without either beds or bed-clothes; the children, generally in rags, are often absolutely naked; and, whenever the potatoe crop becomes even in a slight degree deficient, which is found to be the case once every five or six years, the scourge of famine and disease is felt in every corner of the country! Mr. Maurice Fitzgerald, M. P., informed the committee on the Employment of the Irish Poor, that 'he had known the peasantry of Kerry quit their houses in search of employment, offering to work for the merest subsistence that could be obtained, for two-pence a day, in short for any thing that would purchase food enough to keep them alive for the next twenty-four hours.' Mr. Tighe mentions, that 'the number of persons in Ireland supported by charity is quite inconceivable; they must be supported either by charity, or by pillage and plunder; to the want of employment I attribute every thing that afflicts and disgraces the country.' (Report p. 153.) 'In the part of the country (Cork) with which I am best acquainted,' says Mr. O'Drischoll, 'the condition of the people is the very worst that can possibly be; nothing can be worse than the condition of the lower classes of laborers, and the farmers are not much better. The land is overpeopled and exhausted.' (Report on the State of Ireland, p. 380) Dr. Rogan, a physician of eminence, employed by government to report on the state of disease in the north of Ireland, states, in his valuable work on the Fever in Ulster, that 'throughout the extensive counties of Tyrone, Donegall, and Derry, the population is only limited by the difficulty of procuring food. Owing to the universal adoption of the cottier system, and to the custom of dividing farms among sons at the death of the father, the laboring classes are infinitely more numerous than are required for the purposes of industry. Under these circumstances, they are engaged in a constant struggle for the bare necessaries of life, and never enjoy its comforts,' (p. 8). And, not unnecessarily to multiply references, we shall only further subjoin the following extract from the evidence of Dr. Doyle, the catholic bishop of Leighlin. 'The population is immediately increased, as every one must perceive, by improvident marriages; but those marriages themselves, in my opinion, result in a great measure from the extreme poverty of the people; for that poverty has paralyzed their energies; it has prevented them from taking such an interest in creating a respectable situation for themselves in life, as men possessed of some property always feel; for those wretched people say their state cannot be worse when married than before, and hence they go together. Their depression throws them together, like savages in a wood. It is a frightful state of society; and, when it is considered, it fills me with so much pain and horror, that I have frequently prayed to God, if it were his will, rather to take me out of life than to leave me to witness such evils.' (Report, p. 208).

Statements to the same effect might be produced from other quarters: but the obvious and pressing question is, What is to become of the wretches who are thus situated? They can obtain no employment in the towns, which are already gorged with unemployed inhabitants: and it is therefore quite evident, that if they are not carried to some other country, or in some way provided for, the landlords will either not be able to continue the system they have begun, and the reign of pauperism and degradation will in consequence be perpetuated, or the ejected paupers will transport themselves to Great Britain, and lay the foundations of the same wretchedness here that is now universal in their own country. It is thus clear, that, in whatever point of view this subject may be considered, it is of paramount importance to the people of Britain. But we need not reason hypothetically on the subject. The process of equalisation has already commenced. 'We believe that it is not too much to say,' observes the Edinburgh Review, No. 89, 'that at this moment from a fourth to a third part of the laborers in the west of Scotland and the west of England consist of Irishmen. The latter have almost entirely supplanted the Scotch and English laborers in all those departments in which strength is of more importance than skill; and they are rapidly gaining on them in the others. The consequence is, that a double injury is inflicted upon the native population of Britain. In the first place, their wages are reduced by the competition of the Irish; and, in the second place, their opinions with respect to what is neces-

sary for their comfortable and decent subsistence, are lowered by the contaminating influence of example, and by familiar intercourse with those who are content to vegetate in filth and misery. Previously to the increased facilities of conveyance afforded by means of steam navigation, the expense of the passage from Ireland to Britain, trifling as it was even then, formed a serious obstacle to the influx of Irish poor. But this expense has now been reduced to almost nothing; and it consists with our knowledge, that thousands of poor creatures have been landed from the steam-packets at Liverpool and Greenock within these two years, the cost of whose conveyance from Ireland did not exceed from 4*d*. to 6*d*. each!'

The member for Glasgow, Mr. Campbell, informed the committee of the house of commons, that he had good reason to think, from the reports of well-informed gentlemen, that there are at present not less than 40,000 Irish established in Glasgow and its immediate vicinity. And the gentlemen of Lanarkshire have, in a report on the state of the county, which they transmitted to government on the 23d of September last, particularly called the attention of ministers to this circumstance. They state, that the want of employment, so severely felt at present by the laborers and tradesmen of Glasgow, Paisley, &c., has been greatly aggravated by the continued influx of Irish paupers, who can bear almost every sort of privation; and they farther state, that the natives of the country are endeavouring to escape from their competition, by emigrating in great numbers to America, leaving their places to be occupied by the half-famished hordes that are daily pouring in.

Such are the crying evils and calamities which peremptorily call for attention on the one hand. Government has been engaged, we are happy to find, in investigating them patiently: as also in considering the kind of remedy likely to be afforded by a judicious plan of emigration on the other. The report of a select committee of the house of commons on emigration, which was printed in May last, distinctly recommends assisting the transmission of the Irish poor in considerable numbers to our North American dominions: and the Edinburgh Review wisely presses its being attempted on an adequate scale.

Mr. Bowman Felton, one of the legislative counsellors of the province of Lower Canada, states that it could support 6,000,000 of wheat consumers: at present it does not contain above 460,000 inhabitants. And though there are disadvantages incident to extensive districts, from want of markets, and the injudicious mode in which the lots already occupied have been laid out, there can, at all events, be no doubt that, were it necessary, from 300,000 to 400,000 emigrants might be advantageously located there.

Upper Canada has a noble range of country, which stretches from Lake Simcoe and the rivers Trent and Severn westward, to Lake Huron and the St. Clair River, and southward to Lake Erie, and part of Lake Ontario, with an unoccupied soil of extraordinary fertility, capable of producing the most luxuriant crops of grain. 'The climate,' says Mr. Bouchette, surveyor-general of Lower Canada, 'is so particularly salubrious, that epidemic diseases, either among men or cattle, are almost entirely unknown. Its influence upon the fertility of the soil is more generally perceptible than it is in Lower Canada, and is supposed to be congenial to vegetation in a much superior degree. The winters are shorter, and not always marked with such rigor as in the latter. The duration of the frost is always accompanied with a fine clear sky, and a dry atmosphere. The spring opens, and the resumption of agricultural labors takes place from six weeks to two months earlier than in the neighbourhood of Quebec. The summer heats rarely prevail to excess, and the autumns are usually very friendly to the harvests, and favorable for securing all the late crops.' The ground on the shores of lake Ontario and lake Erie, as far west as the junction of the Thames with the St. Clair Lake, is laid out in townships, and partly settled. But the population is so very thin, as not, on an average, to amount to more than sixteen persons to a square mile in the settled townships; while the fertility of the soil is such, that 120 persons to a square mile would not be a dense population. To the north of the river Thames, along the banks of the river St. Clair, and the shores of lake Huron, round to the river Severn, and from thence to the river that joins Lake Nippissing and Lake Huron, is a boundless extent of country that is entirely unoccupied. The interior of this space has hitherto been but imperfectly explored; but the banks of the St. Clair and the shores of Lake Huron afford the finest situations for settlements. The soil is, in many places, of the greatest fertility, the rivers and lakes teem with fish, and every variety of the best timber is found in the greatest profusion. In 1783 the settlers in Upper Canada were estimated at only 10,000. In 1820 they amounted, according to Mr. Gourlay, to upwards of 134,000; and may now probably amount to nearly 200,000—a miserably small population for a country that could comfortably support many millions of inhabitants.

In Nova Scotia and New Brunswick the winter is more severe than in Upper Canada, and they are a good deal infested with fogs and mists. But their greater proximity to England, and their favorable situation for the fishing business, give them also great advantages.

With regard to the probable expense of this procedure, it has been ascertained that emigrations to Canada were conducted from Glasgow and its neighbourhood in 1821, by a committee of management, at the rate of £2 18*s*. per head, including provisions, which were then low. Any number, it is supposed, might be transferred from Scotland to Quebec at the present time for £3 5*s*. or £3 10*s*. per head, making ample provision for contingencies. From Ireland it has been calculated that emigrants might be conveyed to lots of profitable land in Lower Canada from £4 to £4 10*s*. all expenses included.

On the whole, therefore, we are disposed to think, says the able writer we have already quoted, that the expenses consequent upon the transportation of 1,000,000 of emigrants from Ireland to America, and disposing of them there, might be fairly estimated as under, viz.

| | |
|---|---|
| Expense of conveying 33,000 emigrants to Cape Breton, and establishing them there (passage out and internal conveyance £3 5*s*., establishment £10 10*s*.), £13 15*s*. each . . . . . . | £454,000 |
| Expense of conveying 133,000 emigrants to Nova Scotia, &c. (passage, &c. £3 10*s*., establishment £10 10*s*.) £14 each . . . | 1,862,000 |
| Expense of conveying 350,000 emigrants to America, and furnishing them with a little money, £8 8*s*. each . . . . . . | 2,940,000 |
| Expense of conveying 484,000 emigrants to Lower and Upper Canada and establishing them there (passage, &c. £5 5*s*., establishment £12 10*s*.), £17 15*s*. each . | 8,591,000 |
| Total expense of conveying 1,000,000 of emigrants to America, and establishing them there . . | £13,847,000 |

'This is undoubtedly a very considerable sum; but, considerable as it is, we have no hesitation in saying that, though it were twice as great, it would be well and advantageously laid out in securing the object in view. Look at the alternative under which this question is placed. If, on the one hand, we incur the expense consequent upon the prosecution of emigration on the large scale we have proposed, we shall relieve Ireland of the surplus population by which she is now oppressed and beggared, and shall enable means to be adopted for securing her future and rapid improvement, at the same time that we shall protect and secure our own population from being overrun and degraded by the influx of Irish poor: but if, on the other hand, we refuse to incur this expense, and allow matters to remain on their present footing, it is idle to talk of the improvement of Ireland: her misery will be rendered perpetual; and every year thousands of starving wretches will be cast upon our shores, till our people have been sunk, in consequence of their influx, to the same level of hopeless misery as the Irish, and the scourge of universal mendicity has avenged centuries of misgovernment!'

We must finally be allowed to quote Mr. Malthus himself as arguing for the necessity of occasional emigration.

'If,' says he, in 1817, 'from a combination of external and internal causes, a very great stimulus should be given to the population of a country for ten or twelve years together, and it should then comparatively cease, it is clear that labor will continue flowing into the market, with almost undiminished rapidity, while the means of employing and paying it have been essentially contracted. It is precisely under these circumstances that emigration is most useful as a temporary relief; and it is in these circumstances that Great Britain finds herself placed at present. Though no emigration should take place, the population will by degrees conform itself to the state of the demand for labor; but the interval must be marked by the most severe distress, the amount of which can scarcely be reduced by any human efforts; because, though it may be mitigated at particular periods, and as it affects particular classes, it will be proportionably extended over a larger space of time and a greater number of people. The only real relief in such a case is emigration; and the subject at the present moment is well worthy the attention of the government, both as a matter of humanity and policy.' —*On Population*, vol. ii. pp. 304, 305.

Return of the number of persons who have emigrated from Great Britain and Ireland to the British colonies and to the United States of America, in each year from 1825 to the 31st of December, 1832, distinguishing the ports from which they have sailed, and the countries to which such emigration took place:—

| | 1825. | 1826. | 1827. | 1828. | 1829. | 1830. | 1831. | 1832. |
|---|---|---|---|---|---|---|---|---|
| To the British Colonies in America . . . . | 8,741 | 12,818 | 12,648 | 12,084 | 13,307 | 30,574 | 58,067 | 66,339 |
| To the Cape of Good Hope | 114 | 116 | 114 | 135 | 197 | 204 | 114 | 196 |
| To the Australian Colonies | 485 | 903 | 715 | 1,056 | 2,016 | 1,242 | 1,561 | 3,733 |
| To the United States . | 5,551 | 7,063 | 14,526 | 12,817 | 15,678 | 24,887 | 23,418 | 32,872 |
| Total . . . . | 14,891 | 20,900 | 28,003 | 26,092 | 31,198 | 56,907 | 83,160 | 103,140 |

EMIMS, ancient inhabitants of the land of Canaan beyond Jordan, towards the Dead Sea; who were defeated by Chedorlaomer and his allies. Moses tells us (Gen. xiv. 5) that they were beaten in Shaveh Kirjathaim; which was in the country of Sihon conquered from the Moabites. Josh. xiii. 19—21. The Emims were a warlike people, of a gigantic stature, and very numerous. The Moabites cut off most of them, and incorporated with the rest, when they seized their country. Deut. ii. 10, 11.

EM'INENCE, *n. s.* Fr. *eminent*; Italian,
EM'INENCY, Span. and Port. *emi-*
EM'INENT, *adj.* *nente*; Lat. *eminens*, from
EM'INENTLY, *adv.* *e* out, and *maneo*; Gr. *μενω*, to stand. Loftiness of place, or station; conspicuousness: eminence is also a title applied particularly to the Romish cardinals.

Thou hast built unto thee an *eminent* place.
*Ezekiel.*

These two were men of *eminency*, of learning as well as piety. *Stillingfleet.*

Censure is the tax a man pays to the public for being *eminent*. *Swift.*

First let the Kennel be the huntsman's care,
Upon some little *eminence* erect,
And fronting to the ruddy dawn. *Somerville.*

Whosoever shall look heedfully upon those who are *eminent* for their riches, will not think their condition such as that he should hazard his quiet, and much less his virtue, to obtain it. *Johnson.*

I was once told by a great master that no man ever excelled in painting, who was *eminently* curious about pencils and colours. *Id.*

As his own *eminence* was founded upon the power of the church of Rome, he was a zealous defender of that superstition. *Robertson. History of Scotland.*

There is no one particular that I know of wherein self-knowledge more *eminently* consists, than it does in this. *Mason.*

The road to *eminence* and power from obscure condition, ought not to be made too easy, nor a thing too much of course. If rare merit be the rarest of all rare things, it ought to pass through some sort of probation. The temple of honour ought to be seated on an *eminence*. If it be open through virtue, let it be remembered too, that virtue is never tried but by some difficulty and some struggle. *Burke.*

Strange, that such folly, as lifts bloated man
To *eminence* fit only for a god,
Should ever drivel out of human lips,
Even in the cradled weakness of the world!
*Cowper.*

Ye cherub train, that brought him on his way,
O leave him not 'midst tumult and dismay;
For now youth's *eminence* he gains:
But what a weary length of lingering toil remains!
*Beattie.*

EMINENCE, an honorary title. The decree of pope Urban VII., appointing that the cardinals should be addressed by this title is dated January 10th, 1630. They then laid aside the titles of illustrissimi, and reverendissimi, which they had borne before. The ci-devant grand master of Malta was likewise addressed under the quality of eminence. Popes John VIII., and Gregory VII., gave this title to the kings of France. The emperors have likewise borne it.

EMIR, a title of dignity among the Turks, signifying a prince. This title was first given to the caliphs; but, when they assumed the title of sultans, that of emir remained to their children; as that of Cæsar among the Romans. At length the title was awarded to all who were descended from Mahomet by his daughter Fatimah, and who wear the green turban instead of the white. The Turks also call the viziers, bashaws, or governors of provinces, by this title.

EMIT', *v. a.* } Lat. *emitto*, from *e* forth and
EM'ISSARY, } *mitto*; Gr. μεθιω; Chald. משא
EMIS'SION. } to send. To send forth, issue or give out; eject: an emissary is one sent forth; also in a technical sense one that emits or sends out.

Tickling causeth laughter: the cause may be the *emission* of the spirits, and so of the breath by a flight from titillation. *Bacon.*

Clifford, an *emissary* and spy of the king's, fled over into Flanders with his privity. *Bacon's Henry VII.*

You shall neither eat nor sleep,
No, nor forth your window peep,
With your *emissary* eye,
To fetch in the forms go by.
*Ben Jonson's Underw.*

Populosity naturally requireth transmigration and *emission* of colonies. *Browne's Vulgar Errours.*

Cover them with glasses; but upon all warm and benign *emissions* of the sun, and sweet showers, give them air. *Evelyn.*

Affection, in the state of innocence, was happily pitched upon its right object; it flamed up in direct fervours of devotion to God, and in collateral *emissions* of charity to its neighbour. *South.*

Pay sacred reverence to Apollo's song,
Lest wrathful, the far-shooting god *emit*
His fatal arrows. *Prior.*

These baths continually *emit* a manifest and very sensible heat; nay, some of them, at some times, send forth an actual and visible flame. *Woodward's Natural History.*

The soil, being fruitful and rich, *emits* steams, consisting of volatile and active parts. *Arbuthnot on Air.*

Wherever there are *emissaries*, there are absorbent vessels in the skin; and, by the absorbent vessels, mercury will pass into the blood. *Id. On Aliments.*

That a citation be valid, it ought to be decreed and *emitted* by the judge's authority, and at the instance of the party. *Ayliffe.*

The Jesuits send over *emissaries*, with instructions to personate themselves members of the several sects among us. *Swift.*

In some lime-stones the living animals seem to have been buried as well as their shells during some great convulsion of nature; these shells contain a black coaly substance within them, in others some phlogiston or volatile alkali from the bodies of the dead animals remains mixed with the stone, which is then called liver-stone as it *emits* a sulphurous smell on being struck. *Darwin.*

Water in descending down elevated situations, if the outlet for it below is not sufficient for its *emission*, acts with a force equal to the height of the column, as is seen in an experimental machine called the philosophical bellows, in which a few pints of water are made to raise many hundred pounds. *Id.*

EMLYN (Thomas), a Unitarian minister, born at Stamford in Lincolnshire, in 1663. After receiving a preparatory education, he became chaplain to the countess of Donegal, a dissenter, whom he accompanied to Ireland. In 1683 he returned to England, and was chosen minister of a congregation at Lowestoff. In 1691 he removed to Dublin, at the invitation of Mr. Boyce, to be his assistant; but venturing to preach Arian doctrines the Dublin synod suspended him from the ministry; on which he wrote a book entitled, An humble Enquiry into the Scripture Account of Jesus Christ. For this, a prosecution was instituted against him, and, the jury having found him guilty of blasphemy, he was sentenced to pay a fine of £1000 and to suffer one year's imprisonment. The fine was afterwards commuted for £70, but he remained two years in confinement. After his release he went to London, where he officiated to a small congregation for a few years. He died in 1743. Besides the above work, he wrote, 1. Tracts on Socinianism; 2. Vindication of the Worship of the Lord Jesus Christ, on Unitarian principles, 8vo.; 3. The supreme Deity of God the Father demonstrated;

4. A Treatise on Baptism; 5. Inquiry into the original authority of 1 John v. 7, &c.

EMMA, daughter of Richard II., duke of Normandy, and mother of Edward the Confessor, king of England. She was first married to Ethelred, who was obliged to go to Normandy with his sons Alfred and Edward, upon the invasion of the kingdom by the Danes. After his death she married Canute. See ENGLAND. During the reign of her son, the earl of Kent accused her of an improper intercourse with her relation, the bishop of Winchester, on which, to prove her innocence, she is said to have walked barefoot over burning ploughshares, without being hurt.

EMMERICH, a neat town of Prussia, situated in a fruitful plain on the right bank of the Rhine. Population 4000. Five miles north-east of Cleves.

EM'MET, *n. s.* Sax. æmette; Belg. *emte*; Teut. *ameise*, from the Sax. verb ametan to provide. Another name for the ant. See ANT.

EMMET (Thomas Addis), an eminent Irish lawyer and patriot, was born in the city of Cork, in Ireland, in 1765. He was placed at the university of Dublin, where he obtained an *optimè*, was designed for the profession of medicine, and pursued his medical studies at Edinburgh. The death of his elder brother, a member of the Irish bar, induced him to pass to the study of the law. He went to London, read two years in the Temple, and attended the courts at Westminster. On his return to Dublin he commenced practice, and soon obtained distinction and business. The celebrated Curran was one of his circuit and term companions. Being of an ardent character, and enthusiastically Irish, he early imbibed an antipathy against British connexion. When the societies of united Irishmen were revived in the year 1795, Emmet joined the association, and soon became a leader. Their object was revolution, and an independent government for Ireland. Emmet acted as one of the grand executive committee of the societies, who consisted of at least 500,000 men. March 12, 1798, he was arrested, and committed to prison at Dublin, as a conspirator, by the vice-regal government, along with Oliver Bond, doctor Macneven, and other chiefs of the disaffected party. In July, after a severe confinement, an interview took place beetween Emmet and lord Castlereagh, at Dublin castle, and it was agreed that he and the other state prisoners should be permitted to go to the United States, as soon as they had disclosed their plans of revolution, and the projected alliance between the united Irishmen and France. These disclosures were made in a memoir, delivered August 4, but without the confession of any names, which were inflexibly refused by the writers. They were, soon after, examined in person before the secret committees of both houses of the Irish parliament. Instead, however, of being sent to the United States, Emmet and nineteen more were, early in 1799, landed in Scotland, and consigned to fort George, a fortress in the county of Nairn. Here they were liberally treated, but their detention lasted three years. At the expiration of that period, the list of pardons arrived, including the name of every prisoner except Emmet. The governor of the fortress released him, notwithstanding, taking all the responsibility. Emmet, and his exemplary wife, who had shared unremittingly his imprisonment, both in Ireland and Scotland, were landed at Cuxhaven from a British frigate, spent the winter of 1802 in Brussels, and that of 1803 in Paris. In October, 1804, they sailed from Bordeaux for the United States, and arrived in New York on the 11th of the next month. Emmet, then about forty years of age, at first hesitated between the professions of the law and medicine; but his friends determined him to undertake the former. George Clinton, then governor of the state of New York, induced him to abandon his original plan of settling in Ohio, and to remain in the city of New York. He was admitted to the bar at once, by special dispensation, and reached the first ranks of the profession in a short time, by indefatigable industry and fervid eloquence. In the course of a few years he rivalled in business and fame the most eminent of the American lawyers. Occasionally the ardour of his temperament and the vivacity of his recollections betrayed him into party politics, but his general career and character were those of a laborious, able, and most successful pleader, an energetic and florid orator, and a courteous gentleman. In 1812 he was appointed to the office of attorney-general of the state of New York. His death took place in the 63rd year of his age, in a remarkable way, Nov. 14, 1827, while attending the trial of an important cause at New York, in the circuit court of the United States, he was seized with an apoplectic fit, which put an end to his existence the following night. A deserved tribute of public respect was paid to his memory. During his imprisonment at fort George, Emmet wrote an Essay towards a History of Ireland, which was printed at New York in the year 1807.

EMMIUS (Ubbo), a learned professor, born at Gretha, in East Friesland in 1547, and chosen rector of the college of Norden in 1579; from which place he was ejected in 1587, for refusing to subscribe the Confession of Augsburg. In 1588 he was made rector of the college of Leer; and when the city of Groningen confederated with the United Provinces, the magistrates appointed him rector of that college: which employment he filled with the highest reputation for nearly twenty years. The college being erected into a university, he was the first rector. He wrote Vetus Græcia illustrata, 3 vols.; Decades Rerum Frisicarum; and many other valuable works. He died in 1625.

EMOL'LIENT, *n. s.* & *adj.* } Fr. *emollir*; Lat.
EMOLLI'TION, *n. s.* } *emollire*, from *e*, expletive, and *mollis*; Gr. μαλακος soft, from the verb μαλασσω; Heb. מלין to sooth. That which softens, supples or soothes certain parts or solids of the body; the act of softening or suppling.

EMOL'UMENT. Fr. *emolument*; Lat. *emolumentum*, from *molo* to grind; emolument originally signifying the grist gained by the miller for grinding corn, &c.: and hence profit, advantage, remuneration generally.

EMO'TION, *n. s.* Fr. *emotion*, from Latin *emoveo*, *emotus*, *e* and *moveo* to move, rouse, excite. Emotion is vehemence, or its consequence, disturbance of mind.

The first great sub-division, then, which I would form of the internal class, is, into our intellectual states of mind, and our *emotions*. The latter of these classes comprehends all, or nearly all, the mental states, which have been classed by others under the head of active powers. *Dr. T. Brown.*

And when winds are at war with the ocean,
As the breasts I believed in with me,
If their billows excite an *emotion*
It is that they bear me from thee. *Byron.*

EMPALE', *v. a.* Fr. *empaler*, a compound of em and pale. To enclose, fence, or fortify, with pales; also to pierce with a pale or stake.

Round about her work she did *empale*
With a fair border wrought of sundry flowers. *Spenser.*

Keep yourselves in breath,
And when I have the bloody Hector found,
*Empale* him with your weapons round about. *Shakspeare.*

All that dwell near enemies *empale* villages, to save themselves from surprise. *Raleigh's Essays.*

They have *empaled* within a zodiack
The free-born sun, and keep twelve signs awake
To watch his steps; the goat and crab controul
And fright him back. *Donne.*

The English *empaled* themselves with their pikes, and therewith bare off their enemies. *Hayward.*

Impenetrable, *empaled* with circling fire,
Yet unconsumed. *Milton's Paradise Lost.*

Who can bear this, resolve to be *empaled?*
His skin flead off, and roasted yet alive? *Southerne.*

Let them each be broken on the rack;
Then, with what life remains, *empaled* and left
To writhe at leisure round the bloody stake. *Addison.*

Nay, I don't believe they will be contented with hanging; they talk of *empaling*, or breaking on the wheel. *Arbuthnot.*

EMPALEMENT, from in and palus, Lat. a stake, an ancient barbarous punishment, which consisted in thrusting a stake up the fundament. It is mentioned by Juvenal. It was often inflicted under Nero, and continues to be so in Turkey, and in Arabia.

EMPALEMENT OF A FLOWER, the same with calyx.

EM'PANNEL, *v. a.* & *n. s.* From the Fr. *panne*, a piece of parchment on which the names of persons summoned as jurors are written. To summon or form a jury: as a noun it has been used for the list or parchment itself; but panel is the more usual word in modern times.

I shall not need to *empannel* a jury of moralists or divines, every man's own breast sufficiently instructing him. *Government of the Tongue.*

EMPA'RLANCE, *n. s.* From Fr. *parler*, signifieth, in law, says Cowell, a desire or petition in court of a day to pause what is best to do: and it is sometimes used for the conference of a jury in the cause committed to them: in a general sense it means parley.

——Talus forth issuing from the tent,
Unto the wall his way did fearlesse take,
To weeten what that trumpit's sounding ment,
Where that same damzell loudly him bespake,
And shewed that with his lord she would *emparlance*
make. *Spenser. Faerie Queene*

EMPAS'SION, *v. a.* } From em, or en, and pas-
EMPAS'SIONATE, *adj.* } sion. To move or fill with passion: strongly affected or moved.

With the near touch thereof in tender heart,
The Briton prince was sore *empassionate*. *Spenser.*

Unto my eyes strange shows presented were,
Picturing that which I in mind embraced,
That yet those sights *empassion* me full near. *Id.*

So, standing, moving, or to height upgrown,
The tempter, all *empassioned*, thus began. *Milton.*

EMPEDOCLES, a celebrated philosopher and poet, born at Agrigentum, in Sicily. He followed the Pythagorean philosophy, and admitted the metempsychosis. He constantly appeared with a crown of gold on his head. Yet Aristotle says, that he was a great lover of liberty, extremely averse to state and command, and that he even refused a kingdom that was offered him. His principal work was a Treatise, in verse, on the Nature and Principles of Things. Aristotle, Lucretius, and the ancients, make the most magnificent eulogiums on his poetry and eloquence. He taught rhetoric; and often alleviated the anxieties of his mind, as well as the pains of his body, with music. It is reported, that his curiosity to visit the flames of the crater of Ætna proved fatal to him. Some maintain that he wished it to be believed that he was a god; and that his death might be unknown he threw himself into the crater and perished in the flames. His expectations, however, were frustrated; and the volcano, by throwing up one of his sandals, discovered to the world that Empedocles had perished by fire. Others report that he lived to an extreme old age; and that he was drowned in the sea about A.A.C. 440.

EMPE'OPLE, *v. a.* From em and people. To form into a people or community.

He wondered much, and 'gan enquire
What stately building durst so high extend
Her lofty towers unto the starry sphere,
And what unknown nation there *empeopled* were? *Spenser.*

EM'PEROR, *n. s.* } Fr. *empereur*; Span.
EM'PERESS, or } and Port. *emperador*; Ital.
EM'PRESS, } and Lat. *imperator*, from
EM'PERY, } *impero*, to command, i. e.
EM'PIRE. } *in* and *paro*, to make ready or prepare, the first command given to the Roman soldiers previous to marching.—Adams. A high monarchical title. Emperess and empress are its feminines: empery and empire, the authority possessed, or dominion governed by an emperor.

But the iewis crieden and seiden, if thou delyverist this thou art not the *empouris* frend. *Wiclif. Jon.* 19.

Like to an eagle in his kingly pride,
Soring through his wide *empire* of the aire,
To weather his broad sailes. *Spenser. Faerie Queene.*

Sextus Pompeius
Hath given the dare to Cæsar, and commands
The *empire* of the sea. *Shakspeare. Antony and Cleopatra.*

Take on you the charge
And kingly government of this your land,
Not as protector, steward, substitute,

But as successively from blood to blood,
Your right of birth, your empery, your own. *Id.*

Charles the *emperour*,
Under pretence to see the queen his aunt,
Makes visitation. *Id. Henry VIII.*

Lavinia will I make my *emperess*,
Rome's royal mistress, mistress of my heart. *Id.*

Long, long, may you on earth our *empress* reign,
Ere you in heaven a glorious angel stand. *Davies.*

Let your nimble feet
Tread subtile circles, that may always meet
In point to him; and figures, to express
The grace of him, and his great *emperess*. *Ben Jonson.*

They are the moths and scarabs of a state,
The bane of *empires*, and the dregs of courts,
Who to endear themselves to an employment,
Care not whose fame they blast. *Id.*

*Empress* of this fair world, resplendent Eve. *Milton.*

A nation extended over vast tracts of land, and numbers of people, arrives in time at the ancient name of kingdom, or modern of *empire*. *Temple.*

The *emperor* one day took up a pencil which fell from the hand of Titian, who was then drawing his picture; and, upon the compliment which Titian made him on that occasion, he said, Titian deserves to be served by Cæsar. *Dryden.*

Yet, London, *empress* of the northern clime,
By an high fate thou greatly didst expire. *Id.*

Assert, ye fair ones, who in judgment sit,
Your ancient *empire* over love and wit. *Rowe.*

To give pain is the tyranny, to make happy, the true *empire* of beauty. *Steele.*

Wisdom, thou sayest, from heaven received her birth;
Her beams transmitted to the subject earth:
Yet this great *empress* of the human soul,
Does only with imagined power controul,
If restless passion, by rebellious sway,
Compels the weak usurper to obey. *Prior.*

What are riches, *empire*, power,
But larger means to gratify the will?
The steps on which we tread, to rise and reach
Our wish. *Congreve.*

The pride of nature would as soon admit
Competitors in *empire* as in wit;
Onward they rush at Fame's imperious call,
And less than greatest would not be at all. *Churchill.*

I am provoked at the contempt which most historians show for humanity in general: one would think by them that the whole human species consisted but of about 150 people, called and dignified (commonly very undeservedly too) by the titles of *emperors*, kings, popes, generals, and ministers. *Chesterfield.*

An *emperor* in his night-cap would not meet with half the respect of an *emperor* with a crown. *Goldsmith.*

It became the common belief, that a prince would arise at that time in Judea, who would change the face of the world, and extend his *empire* from one end of the earth to the other. *Robertson's Sermons.*

Mourn him, thou Sun, great source of light!
Mourn, *empress* of the silent night!
And you, ye twinkling starnies bright,
My Matthew mourn!
For through your orbs he's ta'en his flight,
Ne'er to return. *Burns.*

Taking in the whole view of life, it is more safe to live under the jurisdiction of severe but steady reason, than under the *empire* of indulgent, but capricious passion. *Burke.*

Folly such as yours,
Graced with a sword, and worthier of a fan,
Has made, what enemies could ne'er have done,
Our arch of *empire*, steadfast but for you,
A mutilated structure, soon to fall. *Cowper.*

Whence Reason's *empire* o'er the world presides,
And man from brute, and man from man divides;
Compares and measures by imagined lines
Ellipses, circles, tangents, angles, sines. *Darwin.*

Fallen are the trophies of Assyrian power,
And Persia's proud dominion is no more;
Yea, though to both superior far in fame,
Thine empire, Latium, is an empty name. *Beattie.*

The great extent of the Roman empire was one chief cause of that despotism which came at last to prevail in it. *Id.*

EMPEROR, among the ancient Romans, signified a general of an army, who, for some extraordinary success, had been complimented with this appellation. Thus Augustus, having obtained no less than twenty victories, was as often saluted with the title emperor; and Titus was denominated emperor by his army after the reduction of Jerusalem. Afterwards, it came to denominate an absolute monarch or supreme commander of an empire. In this sense Julius Cæsar was called emperor: the same title descended with the dignity to Octavius, Tiberius, and Caligula; and afterwards it became elective. The title emperor does not, and cannot, add any thing to the rights of sovereignty: its effect has only been to give precedence and pre-eminence above other sovereigns. It has been sometimes disputed, if emperors have the power of disposing of the regal title. They have certainly sometimes taken upon them to erect kingdoms: thus Bohemia and Poland are said to have been raised to that dignity: thus also, the emperor Charles II. in 877, gave Provence to Boson, putting the diadem on his head, and decreeing him to be called king, ut more priscorum imperatorum regibus videretur dominari. And the emperor Leopold erected ducal Prussia into a kingdom in favor of the elector of Brandenburg; though several of the kings of Europe refused to acknowledge him in that capacity, until the treaty of Utrecht in 1712. In the east, the title and quality of emperor are more frequent than among us: thus, the sovereign princes of China, Japan, Mogul, Persia, &c., have been called emperors. In 1723 the czar of Muscovy assumed the title of emperor of all the Russias, and procured himself to be recognized as such by the princes and states of Europe. In the west, the title was long restrained to the emperors of Germany. The first who bore it was Charlemagne, who had it conferred upon him by pope Leo III. having indeed had all the power before. The imperial prerogatives were formerly very extensive. At the close of the Saxon race, A.D. 1024, they exercised the right of conferring ecclesiastical benefices in Germany; of receiving the revenues of them during a vacancy; of succeeding to the effects of intestate ecclesiastics; of confirming or annulling the elections of the popes; of assembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vassals; of

granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper sovereigns; of erecting free cities, and of establishing fairs in them; of assembling the diets of the empire, and of fixing the time of their duration; of coining money, and conferring the same privilege on the states of the empire; and of administering both high and low justice within the territories of the different states: but in the year 1437 they were reduced to the right of conferring all dignities and titles, except the privilege of being a state of the empire; of preces primariæ, or of appointing once during their reign a dignitary in each chapter or religious house; of granting dispensations with respect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet and presiding in them. To which some have added, 1. That all the princes and states of Germany were obliged to do them homage, and swear fidelity to them. 2. That they or their generals had a right to command the forces of all the princes of the empire, when united together, &c. The kings of France were anciently also called emperors, at the time when they reigned with their sons, whom they associated to the crown. Thus Hugh Capet, having associated his son Robert, took the title of emperor, Robert that of king; under which titles they are mentioned in the History of the Council of Rheims, by Gerbert, &c. King Robert is also called emperor of the French by Helgau of Fleury. Lewis the Gross, upon associating his son, did the same. The kings of England had likewise anciently an imperial title, as appears from a charter of king Edgar: Ego Edgarus Anglorum basileus, omniumque regum insularum oceani quæ Britanniam circumjacent, &c. imperator et dominus.—Napoleon Buonaparte, the late emperor of the French, when he assumed that title, in 1804, not only exercised the ancient imperial prerogative of making kings, but obliged the head of the German empire to resign his dignity as Emperor of Germany. See DIET, ELECTOR, and NAPOLEON.

EMPETRUM, berry-bearing heath. A genus of the triandria order, and diœcia class of plants. Male CAL. tripartite: COR. tripetalous; stamina long; the styles nine: BERRY nine-seeded. Two species, of which the E. nigrum, which bears the crow crake berries, is a native of Britain. It grows wild on boggy heaths and mountains. Children sometimes eat the berries; but, when taken in too great quantity, they are apt to occasion a headache. Grouse feed upon them. When boiled with alum, they afford a dark purple dye. Goats are not fond of it. Cows, sheep, and horses, refuse it.

EMPH'ASIS, *n. s.*, EMPHAT'IC, *adj.*, EMPHAT'ICAL, EMPHAT'ICALLY, *adv.* } Fr. *emphase;* Span. and Port. *emphasi;* Ital. *enfasi;* Lat. *emphasis;* Gr. ἐμφασις, from ἐν, expletive, and φασις, speech. Stress or force of pronunciation, and hence of style or argument. Browne uses emphatically as synonymous with apparently.

> Oh, that brave Cæsar!
> — Be choaked with such another *emphasis*.
> *Shakspeare.*

What is delivered of the incurvity of dolphins, must be taken *emphatically*, not really, but in appearance, when they leap above water, and suddenly shoot down again. *Browne.*

It is commonly granted, that *emphatical* colours are light itself, modified by refractions. *Boyle on Col.*

*Emphasis* not so much regards the time as a certain grandeur, whereby some letter, syllable, word, or sentence is rendered more remarkable than the rest, by a more vigorous pronunciation, and a longer stay upon it. *Holder.*

> Cellars and granaries in vain we fill,
> With all the bounteous summer's store;
> If the mind thirst and hunger still,
> The poor rich man's *emphatically* poor.
> *Cowley.*

How *emphatically* and divinely does every word proclaim the truth that I have been speaking of! *South.*

These questions have force and *emphasis*, if they be understood of the antediluvian earth. *Burnet's Theory.*

Where he endeavours to dissuade from carnivorous appetites, how *emphatical* is his reasoning! *Garth.*

In proper and *emphatick* terms thou didst paint the blazing comet's fiery tail. *Arbuthnot. John Bull.*

> Are they not his by a peculiar right,
> And by an *emphasis* of interest his,
> Whose eye they fill with tears of holy joy,
> Whose heart with praise, and whose exalted mind
> With worthy thoughts of that unwearied love,
> That planned, and built, and still upholds a world
> So clothed with beauty for rebellious man?
> *Cowper*

> Thus vowed she at the hallowed shrine,
> Though rashly, though without design·
> And uttered not, for modest dread,
> The last *emphatic* word, to wed;
> Which but to hear, much more to speak,
> With blushes paints a virgin's cheek. *Sheridan.*

EMPHYSE'MA, *n. s.*, EMPHYSEM'ATOUS, *adj.* } Gr. ἐμφυσημα, from ἐμφυσαω, to inflate. A humor of the body; bloated; stuffed.

*Emphysema* is a light puffy humor, easily yielding to the pressure of the finger, arising again in the instant you take it off. *Wiseman.*

The signs of a gangrene are these: the inflammation loses its redness, and becomes duskish and livid; the tenseness of the skin goes off, and feels to the touch flabby or *emphysematous*; and vesications, filled with ichor of different colours, spread all over it. *Sharp's Surgery.*

EMPHYSEMA is a windy tumor, generally occasioned by a fracture of the ribs, and formed by the air insinuating itself, by a small wound, between the skin and muscles, into the substance of the cellular or adipose membrane, spreading itself afterwards up to the neck, head, belly, and other parts, much after the manner in which butchers blow up their veal. See MEDICINE.

EMPIE'RCE, *v. a.* From pierce. To pierce into; to enter into by violent appulse.

> The weapon bright,
> Taking advantage of his open jaw,
> Ran through his mouth with so importune might,
> That deep *empierced* his darksome hollow maw.
> *Spenser.*

EMPI'GHT, *pret.* and *part.* From to pight, or pitch. See PITCH. Set; fixt; fastened.

> But he was wary, and ere it *empight*
> In the meant mark, advanced his shield atween.
> *Spenser.*

**Empire**, in political geography, a large extent of land, under the jurisdiction or government of an emperor. See Emperor. 1. In ancient history we read of four great empires, viz. 1 That of the Assyrians, Chaldeans, and Babylonians; 2. of the Medes and Persians; 3. of the Greeks; and 4. of the Romans. The first subsisted from the time of Nimrod, who founded it A.M. 1800, according to the computation of Usher, to Sardanapalus their last king, in 3257, and consequently lasted above 1450 years. The empire of the Medes commenced under Arbaces, A.M. 3257; was united to that of the Babylonians and Persians under Cyrus, A.M. 3468, and ended with the death of Darius Codomannus in 3674. The Grecian empire lasted only during the reign of Alexander the Great, beginning in A.M. 3674, and terminating with the death of this conqueror in 3681, when his conquests were divided among his captains. The Roman empire commenced with Julius Cæsar, when he was made perpetual dictator, in A.U.C. 708, A.M. 3956, and A.D. 48. The seat of the empire was removed to Byzantium by Constant'ne, A.D. 334, and the east and west were still considered as united under the title of the Roman empire though mostly governed by two different series of emperors, till the total overthrow of the latter under Augustulus, by the Goths, A.D. 476. The Western empire was not revived even in name, till the year 800, when Charles the Great, of France, was proclaimed emperor by the Romans. From this epoch the east and west formed two separate empires; that of the east, governed by Greek emperors, commenced A.D. 802: and, being gradually weakened, terminated under Constantine Palæologus in 1453. The western empire was afterwards known by the appellation of the empire, or German empire. Antiquaries distinguish between the medals of the upper and lower or base empire. The curious only value those of the upper empire, which commences with Cæsar or Augustus, and ends A.D. 260. The lower empire comprehends nearly 1200 years, reckoning down to the destruction of Constantinople in 1453. They usually distinguish two ages, or periods of the lower empire: the first beginning where the upper ends, viz. with Aurelian, and ending with Anastasius, including 200 years; the second beginning with Anastasius, and ending with the Palæologi, which includes 1000 years.

Empire, Eastern. See Constantinople.

Empire, Western. See Germany, and Rome.

EMPIR'IC, *n. s.* | Empir'icism, | Empir'ical, *adj.* | Empir'ically, *adv.* } Fr. *empirique;* Ital. Span. and Port. *empirico;* from the Gr. ἐμπειρικος, from ἐμπειρια, experience. See the article subjoined.

The name of Hippocrates was more effectual to persuade such men as Galen, than to move a silly *empirick*. *Hooke*.

The most sovereign prescription in Galen is but *empirick* to this preservative. *Shakspeare.*

And are manned
With ten *empirics*, in their chamber
Lying for the spirit of amber. *Ben Jonson.*

By fire
Of sooty coal, the *empirick* alchymist
Can turn, or holds it possible to turn,
Metals of drossiest ore to perfect gold. *Milton.*

That every plant might receive a name, according unto the diseases it cureth, was the wish of Paracelsus; a way more likely to multiply *empiricks* than herbalists. *Browne.*

We shall *empirically* and sensibly deduct the causes of blackness from originals, by which we generally observe things denigrated. *Browne's Vulgar Errours.*

Tho' illiterate writer, *empirick*-like applies
To each disease unsafe chance remedies;
The learned in school, when science first began,
Studies with care the anatomy of man. *Dryden.*

Such an aversion and contempt for all manner of innovators, as physicians are apt to have for *empiricks*, or lawyers for pettifoggers. *Swift.*

No; we waited, till the morbid strength of our boulimia for their physic had exhausted the well-stored dispensary of their *empiricism*. It is impossible to guess at the term to which our forbearance would have extended. *Burke.*

Empirics, in medical history, are a sect of physicians, who contended that all hypothetical reasoning respecting the operations of the animal economy was useless, and that observation and experience alone were the foundation of the art of medicine.

The origin of this sect is variously stated by different writers of antiquity. The empiric physicians themselves seem to have considered Acron of Agrigentum, a contemporary and rival of Empedocles, in the seventieth olympiad, as their founder; and Pliny has asserted the same opinion, in his sketch of the history of medicine. The best historians refer the establishment of this sect to about the 123rd olympiad; but they are not agreed as to the individual who first promulgated the doctrine of empiricism. Galen and others have ascribed the origin of the sect to Philinus of Cos, a disciple of Herophilus, to whom he was said to be indebted for the first hints of his system. Celsus, however, asserts, that Serapion was the first who maintained this doctrine. He was born, and practised medicine, at Alexandria, and appears to have been contemporary with Philinus. Observation, record, and the substitution of similar means, were the three fundamental resources of the art of medicine, according to the empirics; and these were denominated by Glaucias, and others, the tripod of medicine (τρίπης της ἰατρικῆς). Compared with this species of investigation, how futile are the speculations, misnamed philosophy in the schools, relative to elements, and essences, which had no existence, except in the imagination of the disputants. For it must be observed, that the ancient empirics did not disregard the dictates of reason and reflection; they only deprecated the application of them to circumstances out of the reach of the senses, and beyond the scope of experiment.

EMPIS, in zoology, a genus of insects belonging to the order diptera; of which the characters are these: the proboscis is of a horny substance, bivalve, reflexed under the head and breast, and longer than the thorax.

EMPLAS'TER, *v. a.* & *n. s.* } Fr. *emplâtre;*
EMPLAS'TIC, *adj.* } Span. *emplastro;* Lat. *emplastrum;* Gr. εμπλαστρον, from εμπλασσω, i. e. εν, and πλασσω, to form. To cover or hide with plaster: hence, to hide generally; emplastic is viscous; glutinous; like a plaster.

All *emplasters*, applied to the breast, ought to have a hole for the nipples. *Wiseman's Surgery.*

Resin, by its *emplastick* quality, mixed with oil of roses, perfects the concoction. *Id.*

*Emplastick* applications are not sufficient to defend a wound from the air. *Arbuthnot on Air.*

They must be cut out to the quick, and the sores *emplastered* with tar. *Mortimer's Husbandry.*

EMPLE'AD, *v. a.* From em and plead. To indict; to prefer a charge against; to accuse.

To terrify and torture them, their tyrannous masters did often *emplead*, arrest, cast them into prison, and thereby consume them to worse than nothing. *Hayward*

Antiquity thought thunder the immediate voice o. Jupiter, and *empleaded* them of impiety that referred it to natural casualties. *Glanville's Scepsis.*

Since none the living villains dare *emplead*,
Arraign them in the persons of the dead. *Dryden.*

EMPLEURUM, in botany, a genus of the monœcia tetrandria class and order. Male CAL. four-cleft: COR. none: stigma cylindric: CAPS. opening at the side: SEED one, arilled. There is one species, a shrub of the Cape.

EMPLOY', *v. a* & *n. s.* } Fr. *emploier;* Sp.
EMPLOY'ABLE, *adj.* } *emplear;* from Lat.
EMPLOY'ER, *n. s.* } *implere*, to fill (the
EMPLOY'MENT. } time). To occupy; to engage in business or work; used with *in*, *about*, *upon*, and less properly with *to;* applied both to time, persons, and things: employ, as a substantive, signifies business, public or private; and is synonymous with employment: employable, fit to be, or that may be employed.

Jonathan and Jahaziah were *employed about* this matter. *Ezra*, x. 15.

The money was *employed to* the making of gallies. 2 *Mac.*

Call not your stocks for me; I serve the king,
On whose *employment* I was sent to you.
*Shakspeare. King Lear.*

Those profitable agents, whose industry either fitteth them abroad for public *employment*, or *employeth* them, after due maturity, *in* the fit service of the commonwealth. *Bp. Hall.*

Their principal learning was applied to the course of the stars, and the rest was *employed in* displaying the brave exploits of their princes. *Temple.*

For thrice, at least, in compass of the year,
Thy vineyard must *employ* the sturdy steer
To turn the glebe. *Dryden's Virgil.*

To study nature will thy time *employ;*
Knowledge and innocence are perfect joy.
*Dryden.*

The labor of those who felled and framed the timber *employed about* the plough must be charged on labor. *Locke.*

The proper business of the understanding is not that, which men always *employ* it *to*. *Id.*

Labor in the beginning gave a right of property, wherever any one was pleased to *employ* it *upon* what was common. *Id.*

Lest animosities should obstruct the course of justice, if one of their own number had the distribution of it, they have always a foreigner for this employ. *Addison on Italy.*

This is a day in which the thoughts of our countrymen ought to be *employed on* serious subjects. *Addison's Freeholder.*

On the happy change, the boy
*Employed* his wonder and his joy. *Prior.*

The cleanly cheese-press she could never turn;
Her awkward fist did ne'er *employ* the churn. *Gay.*

The honours and the burdens of great posts and *employs* were joined together. *Atterbury.*

If any station, any *employment* upon earth be honourable, theirs was. *Id.*

Leaders on each side, instead of intending the public weal, have their hearts wholly set to get or to keep *employments*. *Swift.*

Present to grasp, and future still to find,
The whole *employ* of body and of mind. *Pope.*

That man drives a great trade, and is owner or *employer* of much shipping, and continues and increases in trade and shipping. *Child on Trade.*

The objections made against the doctrine of the chymists, seem *employable* against this hypothesis *Boyle.*

Jesus Christ is furnished with superiour powers to the angels, because he is *employed in* superiour works and appointed to be the sovereign Lord of all the visible and invisible worlds. *Watts.*

His high station in the church placed him in the way of great civil *employments;* his abilities were equal to the greatest of these; nor did he reckon any of them to be above his merit.
*Robertson. History of Scotland.*

Time, with all its celerity, moves slowly on to him whose whole *employment* is to watch its flight.
*Johnson.*

The prospect, such as might enchant despair,
He views it not, or sees no beauty there;
With aching heart, and discontented looks,
Returns at noon to billiards or to books,
But feels, while grasping at his faded joys,
A secret thirst of his renounced *employs*. *Cowper.*

EMPOI'SON, *v. a.* } Fr. *empoisonner;* from
EMPOI'SONER, *n. s.* } em and POISON, which
EMPOI'SONMENT. } see. To kill or destroy by poison.

Mushrooms cause the incubus, or mare in the stomach, therefore the surfeit of them may suffocate and *empoison*. *Bacon.*

He is vehemently suspected to have been the *poisoner* of his wife, thereby to make vacant his bed. *Bacon's Henry VII.*

Leaving no means unattempted of destroying his son, that wicked servant of his undertook to *empoison* him. *Sidney.*

Even in the peaceful rural vale,
Truth, weeping, tells the mournful tale,
How pampered Luxury, Flattery by her side,
The parasite *empoisoning* her ear,
With all the servile wretches in the rear,
Looks o'er proud property, extended wide.
*Burns.*

EMPORIÆ, a double city of the Hither Spain near the Pyrenees: separated by a wall; one part occupied by the Greeks of Phocæa, whence originally are the Massilienses; the other by native Spaniards, to whom was added by Augustus a Roman colony. It is now called AMPURIAS; which see.

EMPOR'IUM, *n. s.* Lat. *emporium;* Gr. εμποριον; εμπορος, is a merchant, from εν and πειρω, to pass over; to travel. A place of concourse for merchants; a mart for trade.

And while this tamed emporium we prepare,
The British ocean shall such triumphs boast,
That those who now disdain our trade to share,
Shall rob like pirates on our wealthy coast. *Dryden.*

I take the prosperous estate of this great *emporium* to be owing to those instances of charity. *Atterbury.*

EMPORIUM, in ancient geography, the name of two cities in Italy, near Placentia; the one well fortified, and guarded by a strong garrison, at which Hannibal met a repulse: the other Hannibal took and plundered. They are now thought to be Ponte Nura, in Placentia.

EMPOV'ERISH, *v. a.* } Fr. *empauvre*; Ital.
EMPOV'ERISHER, *n. s.* } *empoverire*; Span.
EMPOV'ERISHMENT. } and Port. *empobrecer*; from Fr. *pauvre*, which from Lat. *pauper*, poor. To make poor; depauperate: an empoverisher is one who makes poor, wastes, or deteriorates.

Being paid as it is, now some, and then some, it is no great burden unto her, nor any great *empoverishment* to her coffers. *Spenser. State of Ireland.*

Your's sounds aloud, and tells us you excel
No less in courage than in singing well;
While, unconcerned, you let your country know,
They have *empoverished* themselves, not you. *Waller.*

Since they might talk better as they lay together, they *empoverished* their clothes to enrich their bed, which, for that night, might well scorn the shrine of Venus. *Sidney.*

For sense of honour, if it *empoverisheth* a man, it is, in his esteem, neither honour nor sense. *South.*

Fresh roses bring,
To strow my bed, 'till the *empoverished* Spring
Confess her want. *Prior.*

All appeals for justice, or appellations for favour or preferment to another country, are so many grievous *impoverishments*. *Swift's View of Ireland.*

They destroy the weeds and fit the land for aftercrops, being an improver, and not an *empoverisher* of land. *Mortimer.*

EMPO'WER, *v. a.* From em and power.

You are *empowered*, when you please, to give the final decision of wit. *Dryden's Juvenal, Dedication.*

The government shall be *empowered* to grant commissions to all Protestants whatsoever. *Swift.*

Does not the same power that enables them to heal, *empower* them to destroy? *Baker on Learning.*

The duchess of Munster obtained a patent, *empowering* him [Mr. Wood] to coin 180,000 pounds of halfpence and farthings for the kingdom of Ireland. *Johnson. Life of Swift.*

[James I.] obtained an act by which he was *empowered* to summon such as had obtained crown lands during the three last reigns, to produce the rights by which they held them. *Robertson. History of Scotland.*

EM'PRISE, *n. s.* Fr. *emprise*; an abbreviation of enterprise. Hazardous or chivalrous undertaking.

Therefore whylome to knights of great *emprise*
The charge of justice given on trust,
That they might execute her judgments wise,
And with their might beat down licentious lust,
Which proudly did impugn her sentence just.
*Spenser. Faerie Queene.*

Noble minds, of yore, allied were
In brave pursuit of chivalrous *emprise*. *Id.*

A double conquest must you make,
If you atchieve renown by this *emprise*. *Fairfax.*

Fierce faces threatening wars;
Giants of mighty bone, and bold *emprise*. *Milton.*

Thus, 'till the sun had travelled half the skies,
Ambushed we lie, and wait the bold *emprise*. *Pope.*

EMP'TION, *n. s.* Old Fr. *emption*; Lat. *emptio*; from the verb *emo*, *emptus*, to buy. The act of purchasing; or a purchase made.

There is a dispute among the lawyers, whether Glaucus his exchanging his golden armour with the brazen one of Tydides, was *emption* or commutation. *Arbuthnot on Coins.*

EMP'TY, *v. a.* & *n.* & *adj.* } Sax. æmꝑꞇıᵹ,
EMP'TIER, *n. s.* } æmꝑꞇıan, to make
EMP'TINESS. } void. To exhaust; evacuate; deprive of contents; to become exhausted or void: an emptier is one who makes any thing or place void; emptiness the state of vacuity.

The pit was *empty*, there was no water in it. *Genesis.*

Seven *empty* ears blasted with the east wind. *Id.*

Israel is an *empty* vine. *Hosea.*

The *emptiers* have *emptied* them out, and marred their vine-branches. *Nahum*, ii. 2.

They beat him, and sent him away *empty*. *Matthew.*

Heres hore aren shad overtimeliche upon my hed: and the slacke skinne tremblethe of mine *empted* bodie. *Colvile.*

Himself he frees by secret means unseen,
His shackles *empty* left, himself escaped clean. *Spenser.*

I did never know so full a voice issue from so *empty* a heart; but the saying is true, the *empty* vessel makes the greatest sound. *Shakspeare.*

Art thou thus boldened, man, by thy distress,
That in civility thou seem'st so *empty*? *Id.*

Boundless intemperance,
In nature is a tyranny: it hath been
The untimely *emptying* of the happy throne,
And fall of many kings. *Shakspeare. Macbeth.*

His coffers sound
With hollow poverty and *emptiness*. *Shakspeare.*

How comes it that so many worthy and wise men depend upon so many unworthy and *empty* headed fools! *Raleigh.*

Foure things are grievously *empty*: a head without brains, a wit without judgment, a heart without honesty, and a purse without money. *Bp. Earle.*

He alledges that satyrs carried platters full of fruit in their hands; but if they had been *empty* handed, had they been ever the larger satyrs? *Dryden.*

Yet all the little that I got, I spent;
And still returned as *empty* as I went. *Id.*

Nor could another in your room have been,
Except an *emptiness* had come between. *Id.*

Yet this insignificancy in their words, when they come to reason concerning either their tenets or interest, manifestly fills their discourse with abundance of *empty* unintelligible noise and jargon, especially in moral matters. *Locke.*

Where cities stood,
Well fenced, and numerous, desolation reigns,
And *emptiness*; dismayed, unfed unhoused,
The widow and the orphan stroll. *Philips.*

If you have two vessels to fill, and you empty one to fill the other, you gain nothing by that; there still remains one vessel *empty*. *Burnet.*

His answer is a handsome way of exposing an *empty*, trifling, pretending pedant; the wit lively, the satyr courtly and severe. *Felton.*

The ordinary air in which we live and respire, is of so thin a composition, that 16,149 parts of its di-

mensions are mere *emptiness* and nothing; and the remaining one only, material and real substance. *Bentley*.

Mr. Boyle has showed, that air may be rarefied above 10,000 times in vessels of glass; and the heavens are much *emptier* of air than any vacuum we can make below. *Newton*.

I have always observed that your *empty* vessels sound loudest. *Swift*.

Form the judgment about the worth or *emptiness* of things here, according as they are or are not of use, in relation to what is to come after. *Atterbury*.

Pleased in the silent shade with *empty* praise. *Pope*.

Eternal smiles his *emptiness* betray,
As shallow streams run dimpling all the way. *Id*.

The Euxine Sea is conveniently situated for trade, by the communication it has both with Asia and Europe, and the great navigable rivers that *empty* themselves into it. *Arbuthnot*.

Sheep are often blind by fulness of blood: cut their tails, and *empty* them of their blood. *Mortimer*.

Since pulpits fail, and sounding-boards reflect
Most part an *empty* ineffectual sound,
What chance that I, to fame so little known,
Nor conversant with men or manners much,
Should speak to purpose, or with better hope,
Crack the satiric thong? *Cowper*.

Hope sets the stamp of vanity on all
That men have deemed substantial since the fall,
Yet has the wondrous virtue to educe
From *emptiness* itself a real use. *Id*.

Blaze round each frosted rill, or stagnant wave,
And charm the Naiad from her silent cave;
Where, shrined in ice, like Niobe she mourns,
And clasps with hoary arms her *empty* urns. *Darwin*.

Their sceptre broken, and their sword in rust,
Have yielded to the stranger: *empty* halls,
Thin streets, and foreign aspects, such as must
Too oft remind her who and what enthrals,
Have flung a desolate cloud o'er Venice' lovely walls. *Byron*.

EMPU'RPLE, *v. a.* From em and purple. To make of a purple color; to discolor with purple.

Now in loose garlands, thick thrown off, the bright
Pavement, that like a sea of jasper shone,
*Empurpled* with celestial roses smiled. *Milton*.
The deep,
*Empurpled* ran, with gushing gore distained. *Philips*.

EMPU'ZZLE, *v. a.* From em and puzzle. To perplex; to put to a stand.

It hath *empuzzled* the enquiries of others to apprehend, and enforced them unto strange conceptions to make out. *Browne*.

EMPYE'MA, *n. s.* Fr. *empyemé*; Gr. εμπυημα, from εν, within, and πυων, pus. A collection of purulent matter in any part of the body, but more particularly in the cavity of the chest. See MEDICINE, Index.

An *empyema*, or a collection of purulent matter in the breast, if not suddenly cured, doth undoubtedly impel the patient into a phthisical consumption. *Harris*.

There is likewise a consumption from an *empyema*, after an inflammation of the lungs. *Arbuthnot*.

EMPY'REAN, *n. s. & adj.*
EMPY'REAL, *adj.*
EMPY'REUM, *n. s.*
} Fr. *empyrée*; Ital., Span. and Port. *cielo empireo*; Lat. *empyrium*, from Gr. εμπυρος, i. e. εν and πυρ, fire. The highest heaven, supposed to consist of pure fire.

Under his burning wheel
The stedfast *empyrean* shook throughout,
All but the throne itself of God.
*Milton. Paradise Lost*.

Now went forth the morn,
Such as in highest heaven, arrayed in gold
*Empyreal*. *Id*.

And fix our engines, and our ensigns,
Upon the fixt stars' vast dimensions,
—— And prove if they are other suns,
As some have held opinions,
Or windows in the *empyreum*,
From whence those bright effluvia come
Like flames of fire. *Butler*.

But *empyreal* forms, howe'er in sight
Gashed and dismembered easily unite. *Tickell*.

Go, soar with Plato to the *empyreal* sphere,
To the first good, first perfect, and first fair. *Pope*.

How nitrous gas from iron ingots driven
Drinks with red lips the purest breath of heaven;
How, while conferva from its tender hair
Gives in bright bubbles *empyrean* air,
The crystal floods phlogistic ores calcine,
And the pure ether marries with the mine. *Darwin*.

EMPYRE'UM, *n. s.*
EMPYREUMAT'IC, *adv.*
EMPYREUMAT'ICAL,
} Fr. *empyreme*; Greek, εμπυρευμα, from the verb εμπυραω, to burn. The burning or boiling of oils, or other matters that give an offensive smell. Empyreumatic is having this burnt, oily smell or taste.

*Empyreumatical* oils, distilled by strong fires in retorts, may be brought to emulate essential oils drawn in limbicks. *Boyle*.

It is so far from admitting an *empyreum*, that it burns clear away without leaving any cinders, or a dust about it. *Harvey*.

The hopes of an elixir insensibly evaporate, and vanish into air, or leave in the recipient a foul *empyreum*. *Decay of Piety*.

EMPY'ROSIS, *n. s.* Gr. εμπυροω. Conflagration; general fire.

The former opinion that held these cataclysms and *empyroses* universal, was such as held that it put a total consummation unto things in this lower world, especially that of conflagration. *Hale*.

EMRUN, or EMBRUN, an ancient town of France, the chief place of a district, in the department of the Alps: it is situated on the Durance, in the midst of fertile vallies, and is chiefly remarkable for its cathedral. Inhabitants about 3000.

EMS, a considerable river of Westphalia, which rises in the principality of Paderborn, and flows through Munster and East Friesland. It finally discharges itself by two arms into the bay of Dollart in the North Sea, a little below Embden. It has a mouth of noble breadth, and the tide, rising for a number of miles, renders it an important medium of transport.

EM'ULE, *v. a.*
EM'ULATE, *v. a.* & *adj.*
EMULA'TION, *n. s.*
EM'ULATIVE, *adj.*
EM'ULATOR, *n. s.*
EM'ULOUS, *adj.*
EM'ULOUSLY, *adv.*

French, *emuler*; Span. *emular*; It. *emulare*; Latin, *æmulor*, from Gr. αμιλλα, a contest. To rival; strive with for excellence; hence to imitate or equal generally. Shakspeare uses the adjective emulate for ambitious. Emulative is disposed, or tending to, rivalry. Emulous, rivalling; desirous to outvie; hence contentious, factious.

There was neither envy nor *emulation* amongst them. *1 Mac.*

He sitting me beside, in that same shade,
Provoked me to play some pleasant fit;
Yet *emuling* my pipe, he took in hand
My pipe, before that *emuled* of many,
And plaid thereon; for well that skill he could. *Spenser.*

I see how thy eye would *emulate* the diamond. *Shakspeare.*

Our last king,
Whose image even but now appeared to us,
Was, as you know, by Fortibras of Norway,
Thereto pricked on by a most *emulate* pride,
Dared to the combat. *Id.*

Mine *emulation*
Hath not that honour in't it had; for where
I thought to crush him in an equal force,
True sword to sword, I'll pitch at him some way,
Or wrath or craft may get him. *Id.*

What madness rules in brainsick men,
When for so slight and frivolous a cause,
Such factious *emulations* shall arise! *Id.*

Whose glorious deeds, but in the fields of late,
Made *emulous* missions 'mongst the gods themselves,
And drave great Mars to faction. *Id.*

In superiours it quencheth jealousy, and layeth their competitors and *emulators* asleep. *Bacon.*

I would have
Him *emulate* you: 'tis no shame to follow
The better precedent. *Ben Jonson's Catiline.*

What the Gaul or Moor could not effect,
Nor *emulous* Carthage, with their length of spite,
Shall be the work of one. *Id.*

Nothing will more try a man's grace, than questions of *emulation*. *Bp. Hall. Contemplations.*

Whether some secret and *emulatory* brawls passed between Zipporah and Miriam, or whether now that Jethro and his family were joined with Israel, &c. the exceptions were frivolous. *Id.*

She is in perpetual diffidence, or actual enmity with her, but always *emulous* and suspectful of her. *Howel's Vocal Forest.*

As long as the world lasts, and honour and virtue and industry have reputation in the world, there will be ambition and *emulation* and appetite in the best and most accomplished men who live in it. *Clarendon.*

By strength
They measure all, of other excellence
Not *emulous*, nor care who them excels. *Milton.*

So tempt they him, and *emulously* vie
To bribe a voice, that empires would not buy. *Granville.*

Those fair ideas to my aid I'll call,
And *emulate* my great original. *Dryden.*

A noble *emulation* heats your breast,
And your own fame now robs you of your rest:
Good actions still must be maintained with good,
As bodies nourished with resembling food. *Id.*

The apostle exhorts the Corinthians to an holy and general *emulation* of the charity of the Macedonians, in contributing freely to the relief of the poor saints at Jerusalem. *South.*

Aristotle allows that some *emulation* may be good, and may be found in some good men; yet envy he utterly condemns, as wicked in itself, and only to be found in wicked minds. *Spratt.*

I promise myself you will look with an eye of favour upon a meeting which owes its original to a mutual *emulation* among its members, who shall show the most profound respect for your paper. *Spectator.*

Good Howard, *emulous* of the Grecian art. *Prior.*

It is likewise attended with a delirium, fury, and an involuntary laughter, the convulsion *emulating* this motion. *Arbuthnot.*

What though no weeping loves thy ashes grace,
Nor polished marble *emulate* thy face. *Pope.*

Each of the rivals courted him with *emulation*; he knew it to be his interest to keep the balance even, and to restrain both, by not joining entirely with either of them. *Robertson. History of Scotland.*

Rhyme, except some religious pieces that are in print, I had given up; but meeting with Ferguson's Scottish Poems, I strung anew my wildly-sounding lyre with *emulating* vigour. *Burns.*

Peace (if insensibility may claim
A right to the meek honours of her name)
To men of pedigree; their noble race,
*Emulous* always of the nearest place
To any throne, except the throne of grace. *Cowper.*

True *emulation*, especially in young and ingenuous minds, is a noble principle; I have known the happiest effects produced by it; I never knew it to be productive of any vice. In all public schools, it is, or ought to be, carefully cherished. *Beattie.*

SNEER. Why, 'tis certain, that unnecessarily to mortify the vanity of any writer is a cruelty which mere dulness never can deserve; but where a base and personal malignity usurps the place of literary *emulation*, the aggressor deserves neither quarter nor pity. *Sheridan.*

EMULGE', *v. a.*
EMUL'GENT, *adj.*
EMUL'SION, *n. s.*

Fr. *emulgente*; Latin, *emulgeo*, *emulgens*; *e* and *emulgeo*; Gr. αμελγω. To milk out. Emulgent is milking or draining out. Emulsion, a form of medicine, by bruising oily seeds and kernels, and drawing out their substances with some liquor, that thereby becomes milky.

It doth furnish the left *emulgent* with one vein. *Browne.*

Through the *emulgent* branches the blood is brought to the kidneys, and is there freed of its serum. *Cheyne.*

The aliment is dissolved by an operation resembling that of making an *emulsion*; in which operation the oily parts of nuts and seeds, being gently ground in a marble mortar, are gradually mixed with some watery liquor, or dissolved into a sweet, thick, turbid, milky liquor, resembling the chyle in an animal body. *Arbuthnot.*

EMUNCTORIES, *n. s.* Fr. *emunctoire*; Ital. *emuntorio*; Lat. *emunctoria*; from *e* and *mungo*; Gr. μυζω, μυγω. To wipe the nose. Those parts of the body where any thing excrementitious is separated and collected for ejectment.

There are receptacles in the body of man, and *emunctories* to drain them of superfluous choler. *More*

Superfluous matter deflows from the body under their proper *emunctories*. *Browne's Vulgar Errours.*

Discoursing of the lungs, I shew that they are the grand *emunctory* of the body; that the main end of respiration is continually to discharge and expel an excrementitious fluid out of the mass of blood. *Woodward's Natural History.*

The regimen in quinsies, which proceed from an obstruction of the glands, must be to use such warm liquors as relax those glands, such as, by stimulating, open the *emunctories* to secrete the humour. *Arbuthnot.*

EMUNCTORIES, in anatomy, are chiefly the kidneys, bladder, and most of the glands.

EN, an inseparable particle, says Dr. Johnson, borrowed by us from the French, and by the French from the Latin *in*. Many words are uncertainly written with *en* or *in*. In many words *en* is changed into *em* for more easy pronunciation. Ben Jonson had previously noticed that 'the letters *i* and *e* have such nearness in our tongue as oftentimes to interchange places.' *En* abounds in our older writers. Mr. Todd has very well suggested, that the uncertainty with respect to *en* or *in* might be removed by due attention to the etymology of words. 'Thus, as entire is admitted to be derived from the French *entier*, the form of intire should not be observed; thus enquire, as being from the French *enquirer*, seems preferable to inquire, from the Latin *inquiro*; and enclose, from the French *enclos*, to the Latin *inclusus*; while, on the other hand, include is directly from the Latin *includo*.'

ENA'BLE, *v. a.* From en and ABLE, which see. To empower; make able, or competent.

If thou wouldst vouchsafe to overspread
Me with the shadow of thy gentle wing,
I should *enabled* be thy acts to sing. *Spenser.*

This purifying of wit, this enriching of memory *enabling* of judgment, and enlarging of conceit, which commonly we call learning; under what name soever it be directed, the final end is, to lead and draw us to as high perfection as our degenerate souls (made worse by their clay lodgings), can be capable of. *Sir P. Sidney.*

The improvement of the understanding is for two ends: first, our own increase of knowledge; secondly, to *enable* us to deliver and make out that knowledge to others. *Locke.*

His great friendship with God might *enable* him, and his compassion might incline him. *Atterbury.*

He points out to him the way of life, strengthens his weakness, restores his lapses, and *enables* him to walk and persevere in it. *Rogers.*

The authority of an umpire, which had been unwarily bestowed upon him, and from which the Scots dreaded no dangerous consequences, *enabled* him to execute his schemes with greater facility. *Robertson. History of Scotland.*

ENACT', *v. a.* } From en and ACT, which
ENACTOR, *n. s.* } see. To act; perform; accomplish; establish by legal acts; represent by action. Shakspeare uses enactors (fol. edit.) in the last sense.

There are dreadful punishments *enacted* against thieves *Sir T. More.*

In true balancing of justice, it is flat wrong to punish the thought or purpose of any before it be *enacted*. *Spenser.*

Valiant Talbot, above human thought,
*Enacted* wonders with his sword and lance. *Shakspeare*

It is *enacted* in the laws of Venice,
If it be proved against an alien,
He seeks the life of any citizen,
The party 'gainst the which he doth contrive,
Shall seize on half his goods *Id.*

I did *enact* Hector. *Id.*

The violence of either grief or joy,
Their own *enactors* with themselves destroy. *Id.*

The senate were authors of all counsels in the state; and what was by them consulted and agreed, was proposed to the people, by whom it was *enacted* or commanded. *Temple.*

He acts also contrary to his trust, when he either employs the force, treasure, and offices of the society, to corrupt the representatives, and gain them to his purposes: or employs them to bring in such, who have promised beforehand what to vote, and what to *enact*. *Locke.*

The great author of our nature, and *enactor* of this law of good and evil, is highly dishonoured. *Atterbury.*

Next, while on pausing step the masked Mimes
*Enact* the triumphs of forgotten times,
Conceal from vulgar throngs the mystic truth,
Or charm with Wisdom's lore the initiate youth. *Darwin.*

'Hath God indeed given appetites to man,
And stored the earth so plenteously with means,
To gratify the hunger of his wish;
And doth he reprobate, and will he damn,
The use of his own bounty? making first
So frail a kind, and then *enacting* laws
So strict, that less than perfect must despair?' *Cowper.*

ENA'LLAGE, *n. s.* Gr. ἐναλλαγη. A figure in grammar, whereby some change is made of the common modes of speech, as when one mood or tense of a verb is put for another.

The grammarians too have a kind of *enallage*, whereby one part of speech, or one accident of a word, is put for another. Such is the change of a pronoun, as when a possessive is put for a relative, e. gr. suus for ejus; or of a verb, as when one mood or tense is put for another. *Dr. A Rees.*

ENA'MBUSH, *v. a.* From ambush. To hide in ambush; to hide with hostile intention.

They went within a vale, close to a flood, whose stream
Used to give all their cattle drink, they there *enambushed* them. *Chapman's Iliad.*

ENAM'EL, *v. a., v. n.* & *n. s.* } From en and
ENAM'ELLER, *n. s.* } AMEL, which
ENAM'ELLING. } see. French *emailler*; Span. and Port. *esmultar*. To inlay; fix colors by fire; variegate with colors. As a neuter verb, to practice inlaying or enamelling. As a substantive, it means the substance or work on which this art is performed. See below

Let dainty wits cry on the sisters nine,
That, bravely masked, their fancies may be told:
Or, Pindar's apes, flaunt they in phrases fine,
*Enamelling* with pyed flowers their thoughts of gold. *Sir P. Sidney.*

Thy graces and good works my creatures be;
I planted knowledge and life's tree in thee;
Which, oh! shall strangers taste? must I, alas!
Frame and *enamel* plate, and drink in glass? *Donne.*

Down from her eyes welled the pearles round,
Upon the bright *enamel* of her face;
Such honey drops on springing flowers are found,
When Phœbus holds the crimson morn in chace. *Fairfax.*

Higher than that wall, a circling row
Of goodliest trees, loaden with the fairest fruit,
Blossoms, and fruits at once of golden hue,
Appeared with gay *enamelled* colours mixed.
*Milton.*

Though it were foolish to colour or *enamel* upon the glasses of telescopes, yet to gild the tubes of them may render them more acceptable to the users, without lessening the clearness of the object.
*Boyle.*

There are various sorts of coloured glasses, pastes, enamels, and factitious gems. *Woodward on Fossils.*

See Pan with flocks, with fruits Pomona crowned;
Here blushing Flora paints the *enamelled* ground.
*Pope.*

His ears and legs,
Fleaked here and there, in gay *enamelled* pride,
Rival the speckled pard. *Somerville.*

These calces, therefore, when mixed with the enamel flux, are melted in crucibles, once or oftener, and the deep coloured opaque glass, thence resulting, is ground into impalpable power, and used for *enamel*.
*Darwin.*

Ah, why should the glittering stream
Reflect thus delusive the scene?
Ah, why does a rosy-tinged beam
Thus vainly *enamel* the green? *Sheridan.*

The substance of the *enamel* is a fine white opaque glass, the material of which will be presently mentioned. This is bought in lump by the *enamellers*, and is first broken down with a hammer, then ground to a sufficiently fine powder, with some water in an agate mortar. *Dr. M. Good.*

On most *enamellings*, and especially on this, it is necessary also to counter-*enamel* the under concave surface of the copper-plate, to prevent its being drawn out of its true shape. *Id.*

ENAMELLING, in painting and the fine arts, is the art of variegating with colors laid upon or into another body. Also a mode of painting, with vitrified colors, on gold, silver, copper, &c., and of melting it at the fire, or of making divers curious works in it at a lamp. This art is of so great antiquity as to render it difficult or impossible to trace it to its origin. It was evidently practised by the Egyptians, from the remains that have been observed on the ornamented envelopes of mummies. From Egypt it passed into Greece, and afterwards into Rome and its provinces, whence it was probably introduced into this country, as various Roman antiquities have been dug up in different parts of Britain, particularly in the Barrows, in which enamels have formed portions of the ornaments. The following are instances in proof of the antiquity of the art in this country: a jewel found at Athelney in Somersetshire, and preserved at Oxford, bears witness to it, and, by an inscription upon it, there is no doubt it was made by order of Alfred. The gold cup given by king John to the corporation of Lynn in Norfolk, proves that the art was known among the Normans, as the sides of the cup are embellished with various figures, whose garments are partly composed of colored enamels. The tomb of Edward the Confessor in Westminster Abbey, built in the reign of Henry III., is ornamented with enamels; and a crosier of William of Wykeham, in the time of Edward III., exhibits curious specimens of the application of the art of enamelling.

Enamels are vitrifiable substances, and are usually arranged into three classes, namely, the transparent, the semitransparent, and the opaque. The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is rendered either semitransparent or opaque by the admixture of metallic oxides. M. Klaproth, some years ago, read to the Royal Academy of Sciences of Berlin a very elaborate paper, the result of much research, 'On the pastes, colored glasses, and enamels of the ancients.' From this we learn that the art of coloring glass seems to be of nearly the same antiquity as the invention of making it, which is proved, not only from written documents, but likewise by the variously colored glass corals with which several of the Egyptian mummies are decorated. This art supposes the possession of some chemical knowledge of the metallic oxides, because these are the only substances capable, as far as we now know, of producing such an effect. Still a difficulty occurs: what were the means and processes employed by the ancients for this purpose? as they had no acquaintance with the mineral acids, which at present are usually employed in the preparation of metallic oxides.

It is, however, certain that the art of giving various colors to glass must have obtained a considerable degree of perfection, as Pliny mentions the artificial imitation of the carbuncle, which was, at that time, a gem in the highest estimation. During the reign of Augustus, the Roman architects began to make use of colored glass in their Mosaic decorations: thus it is known that an application of glass pastes was resorted to in a villa built by the emperor Tiberius on the island of Capri. Several specimens of this coming into the possession of Klaproth, were subjected, by that able chemist, to a chemical analysis; and he has detailed a very particular account of the several processes which he performed to ascertain the component parts of the different colored glasses found in the ruins of the abovementioned villa. His first attempt was upon the antique red glass, of which the color is described as of a lively copper red. The mass was opaque and very bright at the place of fracture; and, of two hundred grains finely triturated, he found the constituent parts to be,

| | Grains. |
|---|---|
| Silex | 142 |
| Oxide of lead | 28 |
| Oxide of copper | 15 |
| Oxide of iron | 2 |
| Alumine | 5 |
| Lime | 3 |
| | 195 |
| Loss | 5 |
| | 200 |

On comparing the external characters of this red glass paste with the cupreous scoriæ of a lively brown red, such as is sometimes obtained on melting copper ores; M. Klaproth imagines that the ancients did not compound the abovementioned paste directly from its constituent parts, but instead of them employed, perhaps, copper scoriæ. And he adds, on this

supposition, they had nothing more to do than to select the best colored pieces to fuse and cast them into plates.

*In green glass he found the constituent parts the same as in the red, but in different proportions. Both receive their color from copper;* and the reason why this metal produces in the one a red, and in the other a green color, depends on the different degrees of its oxigenation; it being an ascertained fact, that copper, in the state of a suboxide, that is, only half saturated with oxygen, produces a reddish enamel, but, when fully saturated with oxygen, the enamel yielded is green.

M. Klaproth next analysed the blue glass paste, in which he found, next to the silex, that the oxide of iron is the most predominating article. He expected to find that the color had been given by cobalt, but could not discover the smallest trace of it, and therefore he infers that its blue color entirely depends on the iron. This excited in him no surprise, knowing that iron, under certain circumstances, is capable of producing a blue enamel, as is clearly exhibited by the beautiful blue colored scoriæ of iron, which are frequently met with in the highly heated furnaces on smelting iron stones. Our object in referring to these experiments is the fact that the colored glass pastes of the ancients agree, in many respects, with modern enamels.

White enamels are composed by melting the oxide of tin with glass, and adding a small quantity of manganese to increase the brilliancy of the color. The addition of oxide of lead or antimony produces a yellow enamel; but a more beautiful yellow may be obtained from the oxide of silver. Reds are formed by an intermixture of the oxides of gold and iron, that composed of the former being the most beautiful and permanent. Greens, violets, and blues are formed from the oxides of copper, cobalt, and iron; and these, when intermixed in different proportions, afford a great variety of intermediate colors. Sometimes the oxides are mixed before they are united to the vitreous bases. Such are, according to this author, the principal ingredients employed in the production of various enamels; but the proportions in which they are used, as well as the degree and continuance of the heat necessary to their perfection, constitute the secrets of the art. Besides these there are probably other substances occasionally used in the composition of enamels, and it has been asserted that the peculiar quality of the best kinds of Venetian enamel is owing to the admixture of a particular substance found on Mount Vesuvius, and ascertained to be thrown up by that volcano.

The principal quality of good enamel, and that which renders it fit for being applied on baked earthenware or on metals, is the facility with which it acquires lustre by a moderate heat, or cherry-red heat, more or less, according to the nature of the enamel, without entering into complete fusion. Enamels applied to earthenware and metals possess this quality. They do not enter into complete fusion; they assume only the state of paste, but of a paste exceedingly firm; and yet when baked one might say that they had been completely fused. There are two methods of painting on enamel: on raw or on baked enamel. Both these methods are employed, or may be employed, for the same object. Solid colors capable of sustaining the fire necessary for baking enamel ground, may be applied in the form of *fused enamel on that which is raw, and the artist may afterwards finish with the tender colors.* The colors applied on the raw material do not require any flux; there is one, even, to which silex must be added; that is, the calx of copper, which gives a very beautiful green: but, when you wish to employ it on the raw material, you must mix with it about two parts of its weight of silex, and bring the mixture into combination by means of heat. You afterwards pulverise the mass you have thus obtained, in order to employ it. To obtain good white enamel, it is of great importance that the lead and tin should be very pure. If these metals contain copper or antimony, as is often the case, the enamel will not be beautiful. Iron is the least hurtful.

*Of colored Enamels.*—All the colors may be produced by the metallic oxides. These colors are more or less fused in the fire, according as they adhere with more or less strength to their oxygen. All metals which readily lose their oxygen, cannot endure a great degree of heat, and are unfit for being employed on the raw materials.

Purple.—This color is the oxide of gold, which may be prepared different ways, as by precipitating, by means of a muriatic solution of tin, a nitro-muriatic solution of gold much diluted in water. The least quantity possible of the solution of tin will be sufficient to form this precipitate. The solution of tin must be added gradually, until you observe the purple color begin to appear: you then stop, and, having suffered the color to be deposited, you put it into an earthen vessel to dry slowly. The different solutions of gold, in whatever manner precipitated, provided the gold is precipitated in the state of an oxide, give always a purple color, which will be more beautiful in proportion to the purity of the oxide, but neither the copper or silver with which gold is generally found alloyed injure this color in a sensible manner: it is changed, however, by iron. The gold precipitate, which gives the most beautiful purple, is certainly fulminating gold, which loses that property when mixed with fluxes. Purple is an abundant color, it is capable of bearing a great deal of flux; and in a small quantity communicates its color to a great deal of matter. It appears that saline fluxes are better suited to it than those in which there are metallic calces. Those, therefore, which have been made with silex, chalk, and borax, or white glass, borax, and a little white oxide of antimony, with a little nitre, as I have already mentioned, ought to be employed with it. Purple will bear from four to twenty parts of flux, and even more, according to the shade required. Painters in enamel employ generally for purple a flux which they call brilliant white. This flux appears to be a semi-opaque enamel, which has been drawn into tubes, and afterwards blown into a ball at an enameller's lamp. These bulbs are afterwards broken in such a manner, that the flux is found

in small scales, which appear like the fragments of small hollow spheres. Enamel painters mix this flux with a little nitre and borax. This matter, which produces a very good effect, was employed without attempting to decompose it. It may be a very fusible common white enamel which has been blown into that form. It is to be remarked, that purple will not bear a strong heat; and the color is always more beautiful if the precipitate is ground with the flux before it has become dry.

Red.—We have no metallic oxide capable of giving directly a fused red; that is to say, we have no metallic calces which, entering into fusion and combining, under the form of transparent glass, with fluxes or glass, give directly a red color. To obtain this color, it must be compounded different ways, as follows:—Take two parts, or two parts and a half (you may, however, take only one part) of sulphate of iron and of sulphate of alumine, fuse them together in their water of crystallisation, and take care to mix them well together. Continue to heat them to complete dryness, then increase the fire so as to bring the mixture to a red heat. The last operation must be performed in a reverberating furnace. Keep the mixture red until it has every where assumed a beautiful red color, which you may ascertain by taking out a little of it from time to time, and suffering it to cool in the air. You may then see whether the matter is sufficiently red: to judge of this it must be left to cool, because while hot it appears black. The red oxides of iron give a red color; but this color is exceedingly fugitive; for, as soon as the oxide of iron enters into fusion, the portion of oxygen, which gives it its red color, leaves it, and it becomes black, yellow, or greenish. To preserve, therefore, the red color of this oxide in the fire, it must be prevented from vitrifying and abandoning its oxygen. I have tried (says M. Clouet) a variety of different substances to give it this fixity, but none of them succeeded except alum. The doses of alum and sulphate of iron may be varied. The more alum you add the paler will be the color. Three parts of alum to one of sulphate of iron give a color which approaches a flesh-color. It is alum also which gives this color the property of becoming fixed at a very strong heat. This color may be employed on raw enamel; it has much more fixity than the purple, but not so much as the blue of cobalt. It may be washed to carry off the superfluous saline matter, but it may be employed also without edulcoration; in that state it is even more fixed and more beautiful. It does not require much flux; the flux which appeared to me to be best suited to it is composed of alum, minium, marine salt, and enamel sand. This flux must be compounded in such a manner as to render it sufficiently fusible for its objects: from two or three parts of it are mixed with the color. In general three parts of flux are used for one of color; but this dose may, and ought to be varied, according to the nature of the color and the shade of it required. Red calx of iron alone, when it enters into fusion with glass, gives a color which seems to be black; but if the color be diluted with a sufficient quantity of glass, it at last becomes of a transparent yellow. Thus the color really produced by calx of iron combined with glass is a yellow color, but which being accumulated becomes so dark, that it appears black. In the process above given for making the red color, oxide of iron does not fuse; and this is the essential point; for, if this color is carried in the fire to vitrification, it becomes black or yellowish, and disappears if the coat be thin, and the oxide of iron present be only in a small quantity.

Yellow.—Though yellow may be obtained in a direct manner, compound yellows are preferred because they are more certain in effect, and more easily applied, than the yellow which may be directly obtained from silver. The compound yellows are obtained in consequence of the same principles as the red color of iron. For this purpose we employ metallic oxides, the vitrification of which must be prevented by mixing with them other substances, such as refractory earths or metallic oxides difficult to be fused. The metallic calces which form the basis of the yellow colors are generally those of lead; as minium, the white calx of lead, or litharge, the white calx of antimony, called diaphoretic antimony; that called crocus metallorum is also employed. This regulus pulverised, and mixed with white oxide, gives likewise a yellow. The following are the different compositions used: one part of the white oxide of antimony, one part of the white oxide of lead, or two or three; these doses are exceedingly variable; one part of alum and one of sal-ammoniac. When these matters have been all pulverised and mixed well together they are put in a vessel over a fire sufficient to sublimate and decompose the sal-ammoniac; and when the matter has assumed a yellow color the operation is finished. The calces of lead mixed in a small quantity either with silex or alumine, also with the pure calx of tin, exceedingly white, gives likewise yellows. One part of th oxide of lead is added to two, three, or four of the other substances above mentioned. In these different compositions for yellow you may use also oxide of iron, either pure or that kind which has been prepared with alum and vitriol of iron; you will then obtain different shades of yellow. From what has been said, you may vary these compositions of yellow as much as you please. Yellows require so little flux that one or two parts, in general, to one of the color are sufficient. Saline fluxes are improper for them, and especially those which contain nitre. They must be used with fluxes composed of enamel-sand, oxide of lead, and borax, without marine salt. A yellow may be obtained also directly from silver. All these mixtures may be varied, and you may try others. For this purpose you may use sulphate of silver, or any oxide of that metal mixed with alumine or silex, or even with both in equal quantities. The whole must be gently heated until the yellow color appears, and the matter is to be employed with the fluxes pointed out for yellow. Yellow of silver, like purple, cannot endure a strong heat; a nitric solution of silver may be precipitated by the ammoniacal phosphate of soda, and you will obtain a yellow precipitate which may be used to paint in that

color with fluxes, which ought then to be a little harder. Besides the methods above mentioned, the best manner of employing the oxide of silver is, in my opinion, to employ it pure: in that case you do not paint but stain. It will be sufficient then to lay a light coating on the place which you wish to stain yellow, and to heat the article gently to give it the color. You must not employ too strong a heat: the degree will easily be found by practice. When the article has been sufficiently heated, you take it from the fire and separate the coating of oxide, which will be found reduced to a regulus. You will then observe the place which it occupied tinged of a beautiful yellow color without thickness. It is chiefly on transparent glass that this process succeeds best. Very fine silver filings produce the same effect: but what seemed to succeed best in this case was sulphate of silver well ground up with a little water, that it may be extended very smooth. From what has been said, it may readily be seen that this yellow must not be employed like other colors; that it must not be applied till the rest have been fused; for, as it is exceedingly fusible and ready to change, it would be injured by the other colors; and as the coating of silver, which is reduced, must be removed, the fluxes would fix it, and prevent the possibility of its being afterwards separated. Working on glass is not attended with this inconvenience, because the silver yellow is applied on the opposite side to that on which the other colors are laid.

GREEN.—Green is obtained directly from the oxide of copper. All the oxides of copper are good; they require little flux, which even must not be too fusible: one part or two of the flux will be sufficient for one oxide. This color agrees with all the fluxes, the saline as well as the metallic, which tends to vary a little the shades. A mixture of yellow and blue is also used to produce greens. Those who paint figures or portraits employ glass composed in this manner; but those who paint glazed vessels, either earthenware or porcelain, employ, in general, copper green. Independently of the beautiful green color produced by oxidated copper, it produces also a very beautiful red color. This beautiful red color produced by copper, is exceeding fugitive. The oxide of copper gives red only when it contains very little oxygen, and approaches near to the state of a regulus. Notwithstanding the difficulty of employing this oxide for a red color, a method has been found to stain transparent glass with different shades of a very beautiful red color by means of calx of copper. The process is as follows: you do not employ the calx of copper pure, but add to it calx of iron, which, for that purpose, must not be too much calcined; you add also a very small quantity of calx of copper to the mass of glass which you are desirous of tinging. The glass at first must have only a very slight tinge of green, inclining to yellow. When the glass has that color you make it pass to red, and even a very dark red, by mixing with it red tartar in powder, or even tallow. You must mix this matter well in the glass, and it will assume a very dark red color. The glass swells up very much by this addition. Before it is worked it must be suffered to settle, and become compact; but as soon as it has fully assumed the color it must be immediately worked, for the color does not remain long, and even often disappears while working; but it may be restored by heating the glass at the flame of a lamp. It is difficult to make this color well, but when it succeeds it is very beautiful, and has a great deal of splendor. By employing the calx of copper alone, for the processes above mentioned, you will obtain, when you succeed well, a red similar to the most beautiful carmine. The calx of iron changes the red into vermilion, according to the quantity added. If we had certain processes for the making of this color, we should obtain all the shades of red from pure red to orange, by using, in different proportions, the oxide of copper and that of iron. The calx of copper fuses argil more easily than silex: the case is the same with calx of iron. If you fuse two or three parts of argil with one of the oxide of copper, and if the heat be sufficient, you will obtain a very opaque enamel, and of vermilion red color. The oxide of copper passes from red to green, through yellow, so that the enamel of copper, which becomes red at a strong heat, may be yellow with a weaker heat. The same effect may be produced by deoxidating copper in different degrees: this will be effected according as the heat is more or less violent. The above composition might, I think, be employed to give a vermilion red color to porcelain. The heat of the porcelain furnace ought to be of sufficient strength to produce the proper effect. The calx of iron fused also with argil, in the same proportions as the calx of copper, gives a very beautiful black. These porportions may, however, be varied.

BLUE.—Blue is obtained from the oxide of cobalt. It is the most fixed of all colors, and becomes equally beautiful with a weak as with a strong heat. The blue produced by cobalt is more beautiful the purer it is, and the more it is oxidated. Arsenic does not hurt it. The saline fluxes which contain nitre are those best suited to it: you add a little also when you employ that flux which contains a little calcined borax, or glass of borax, though you may employ it also with that flux alone. But the flux which, according to my experiments, gives to cobalt-blue the greatest splendor and beauty is that composed of white glass, which contains no metallic calx, of borax, nitre, and diaphoretic antimony well washed. When this glass is made for the purpose of being employed as a flux for blue, you may add less of the white oxide of antimony: a sixth of the whole will be sufficient.

VIOLET.—Black calx of manganese, employed with white fluxes, gives a very beautiful violet. By varying the fluxes the shade of the color may also be varied. It is very fixed as long as it retains its oxygen. The oxide of manganese may produce different colors; but for that purpose it will be necessary that we should be able to fix its oxygen in it in different proportions. How to effect this has, perhaps, never yet been discovered. These are all the colors obtained from metals. From this it is evident that something still remains to be discovered. We do not know what might be produced from the oxides of platina, tungsten, molybdena, and nickel: all these oxides are still to be tried; each of them must produce a color, and perhaps red, which is obtained

neither directly nor with facility from any of the metallic substances formerly known and hitherto employed.

Having laid before the English artists the result of M. Clouet's Researches, as they were presented to the French National Institute, of which he was an associate, we add a few general observations taken from those of our own countrymen, who have made the subject of enamelling their study and employment. The most beautiful and expensive color known in this branch of the art is an exquisitely fine, rich, and purplish tinge, given by the salts and oxides of gold, especially the purple precipitate formed by tin in one form or other, and the nitro-muriate of gold, and also by fulminating gold. This fine color, however, requires much skill in the artist to be fully brought out. Other and commoner reds are given by the oxides of iron, but this requires the mixture of alumine, or some other substance refractory in the fire; otherwise what would, under proper circumstances, be a full red will degenerate into a black.

Yellow is either given by the oxide of silver alone, or by the oxides of lead and antimony, with similar mixtures to those required with iron. The silver is as tender a color as gold, and as readily injured or lost in a high heat. Green is given by the oxide of copper, or it may also be produced by a mixture of yellow colors. Blue is given by cobalt, and this seems the most certain of all enamel colors, and as easy to be managed. Black is produced by a mixture of cobalt and manganese. 'The reader,' says Mr. Aikin in his Chemical Dictionary, 'may conceive how much the difficulties of this nice art are increased, when the object is not merely to lay a uniform colored glazing on a metallic surface, but also to paint that surface with figures and other designs that require extreme delicacy of outline, accuracy of shading, and selection of coloring. The enamel painter has to work, not with actual colors, but with mixtures which he knows from experience, will produce certain colors after the operation of the fire; and to the common skill of the painter in the arrangement of his pallet, and the choice of his colors, the enameller has to add an infinite quantity of practical knowledge of the chemical operation of one metallic oxide on another, the fusibility of his materials, and the utmost degree of heat at which they will attain not only the accuracy of the figures which he has given, but the precise shade of color which he intends to lay on. Painting in enamel requires a succession of firings; first, of the ground which is to receive the design, and which itself requires two firings, and then of the different parts of the design itself. The ground is laid on in the same general way as the common watch-face enamelling already described. The colors are the different metallic oxides melted with some or other vitrescent mixture, and ground to extreme fineness. These are worked up with an essential oil, that of spike is preferred, and next to it the oil of lavender, to the proper consistence of oil colors, and are laid on with a very fine hair brush. The essential oil should be very pure, and by the use of this, rather than any fixed oil, it is probable that the whole may evaporate completely in a moderate heat, and leave no carbonaceous matter in contact with the color when red-hot, which might affect its degree of oxidation, and thence the shade of color which it is intended to produce. As the color of some of the vitrified metallic oxides, such as that of gold, will stand only at a moderate heat, while others will bear and even require a higher temperature to be properly fixed, it forms a great part of the technical skill of the artist to apply different colors in their proper order; fixing first those shades which are produced by the colors that will endure the highest degree of heat. The outline of the design is first traced on the enamel ground, and burnt in; after which the parts are filled up gradually with repeated burnings to the last and finest touches of the tenderest enamel.'

Those who paint on enamel, on earthenware, porcelain, &c., must regulate the fusibility of the colors by the most tender of those employed, as, for example, the purple. When the degree which is best suited to purple has been found, the other less fusible colors may be so regulated (by additions of flux), when it is necessary to fuse all the colors at the same time, and at the same degree of heat. You may paint also in enamel without flux; but all the colors do not equally stand the heat which must be employed. If the enamel, however, on which you paint be very fusible, they may all penetrate it. This manner of painting gives no thickness of color; on the contrary, the colors sink into the enamel at the places where the tints are strongest. To make them penetrate, and give them lustre, a pretty strong fire will be necessary to soften the enamel, and bring it to a state of fusion. This method cannot be practised but on enamel composed with sand, which is called enamel-sand, as already mentioned. It may be readily seen, also, that the colors and enamel capable of enduring the greatest heat will be the most solid, and the least liable to be changed by the air.

The following method of filling up engraving on silver with a durable black enamel, is practised in Persia and India:—

They take half an ounce of silver, two ounces and a half of copper, three ounces and a half of lead, twelve ounces of sulphur, two ounces and a half of sal-ammoniac. The metals are melted together, and poured into a crucible, which has been before filled with pulverised sulphur, made into a paste by means of water; the crucible is then immediately covered, that the sulphur may not take fire, and this regulus is calcined over a smelting-fire, until the superfluous sulphur be burned away. This regulus is then coarsely pounded, and, with a solution of sal-ammoniac, formed into a paste, which is rubbed into the engraving on silver plate. The silver is then wiped clean, and suffered to become so hot under the muffle, that the substance rubbed into the strokes of the engraving melts and adheres to the metal. The silver is afterwards wetted with the solution of sal-ammoniac, and again placed under the muffle till it becomes red-hot. The engraved surface may then be smoothed and polished without any danger of the black substance, which is an artificial kind of silver ore,

either dropping out, or decaying. In this manner is all the silver-plate brought from Russia ornamented with black engraved figures.

The town of Limoges was very celebrated in the twelfth and thirteenth centuries for the excellence of its enamels on various metals. In 1197, tables, vases, basins, tabernacles, candelabra, crosiers, &c., enriched with enamels, were called opus de Limogia, labor Limogiæ, opus Lemoviticum, and are still known to dealers in curiosities of this nature as enamels of Limoges.

The principal artists who have excelled in this beautiful department of the fine arts are Primaticcio and Maitre Roux, who introduced a pure taste in arabesques, and other pictorial ornaments, which were beautifully executed in enamel. Raffaelle and Michel Angiolo also gave designs for enamels on porcelain and earthenware, many of which are still called Raffaelle's ware, or china. Enamelling on metal is of later invention, and is attributed to the French, particularly the smaller and more elegant subjects of history, poetry, and fancy. The first artist who distinguished himself in this latter department, and, in fact, as its inventor, was Jean Toutin, a goldsmith at Chateaudun. He was succeeded by his disciple Gribelin, who was also an excellent artist and workman. Dubie, a goldsmith, made excellent enamels in the galleries of the Louvre. Morliere, a native of Orleans, but who practised at Blois, followed soon after; and was much admired for his miniature enamels for rings and watch-cases. He had for a disciple Robert Vauquer of Blois, who surpassed all his predecessors, particularly in his coloring; he died in 1670. Pierre Chartier, also of Blois, was a celebrated enamellist, particularly in flowers. Jean Petitot, who died in 1691, succeeded as an enamelist of high repute, and practised in England, where his works are well known, and deservedly admired. Bordier followed in the same line, and also practised in this country; as did Louis Hance and Louis de Guernier. Zinck, a Swede, has also obtained a high reputation for the excellence of his works; as did an artist of the name of Boit, whose character as an artist is given in Walpole's Anecdotes of Painters. One of his enamels is there mentioned as being of the extraordinary dimensions of twenty-two inches by sixteen; which have, however, been exceeded by our native artists Bone and Muss. We have also to notice, as eminent practitioners in this art, Schnell, who died in 1704; Sophia Cheron, in 1711; Chatillon, in 1732; Ism. Mengs, in 1764; Nelson, in 1770; Meytens, a Swede, in 1770; Rouquet, who practised in England, and wrote upon the arts; Liotard, Duran, Paguier.

ENAM'OUR, *v. a.* } Span. and Port. *enamorar*; Ital. *inamorare*,
ENAM'ORADO. } from en and AMOUR, which see. To inspire or inflame with love; taking *of* before the object. But Milton and Shakspeare use it without; an enamorado is one desperately in love.

An *enamorado* neglects all other things to accomplish his delight. *Sir T. Herbert.*

Affliction is *enamoured of* thy parts,
And thou art wedded to calamity. *Shakspeare.*

You are very near my brother in his love: he is *enamoured* on Hero. *Id.*

Or should she, confident,
As sitting queen adored on beauty's throne,
Descend with all her winning charms begirt,
To *enamour*, as the zone of Venus once
Brought that effect on Jove, so fables tell. *Milton.*

He, on his side,
Leaning half-raised, with looks of cordial love
Hung over her *enamoured*. *Id. Paradise Lost.*

Your uncle cardinal
Is not so far *enamoured of* a cloyster,
But he will thank you for the crown. *Dryden.*

Strange fondness of the human heart,
*Enamoured* of its harm!
Strange world, that costs it so much smart,
And still has power to charm. *Cowper.*

Various and strange was the long-winded tale;
And halls, and knights, and feats of arms displayed;
Or merry swains, who quaff the nut-brown ale,
And sing *enamoured* of the nut-brown maid. *Beattie.*

ENARRA'TION, *n. s.* Lat. *enarro.* Explanation; exposition.

I might further yet confirm this truth by an anatomical *enarration* of the several compounding parts of these limbs. *Smith on Old Age.*

ENARTHRO'SIS, *n. s.* Ἐν and ἄρθρον. The insertion of one bone into another to form a joint.

*Enarthrosis* is where a good round head enters into a cavity, whether it be a cotyla, or profound cavity; as that of os coxæ, receiving the head of the os femoris; or glene, which is more shallow, as in the scapula, where it receives the humerus. *Wiseman.*

ENARTHROSIS, in anatomy, is a species of Diarthrosis. See ANATOMY.

ENA'UNTER, *adv.* An obsolete word, explained by Spenser himself, to mean lest that.

Anger would not let him speak to the tree,
*Enaunter* his rage might cooled be,
But to the root bent his sturdy stroke. *Spenser.*

ENAS'CENT, *adj.* } From *e*, and nascent;
ENATE'. } Lat. *nascor*, *nascens*, rising; springing or rising forth.

The parts appertaining to the bones, which arise out at a distance from their bodies, are either the adnate or *enate* parts. *Smith on Old Age.*

Thus when in holy triumph Aaron trod,
And offered on the shrine his mystic rod;
First a new bark its silken tissue weaves,
New buds emerging widen into leaves;
Fair fruits protrude, *enascent* flowers expand,
And blush and tremble round the living wand. *Darwin.*

ENCA'GE, *v. a.* From en and cage. To shut up in a cage; to coop up; to confine.

He suffered his kinsman March,
Who is, if every owner were right placed,
Indeed his king, to be *encaged* in Wales,
There, without ransom, to lie forfeited. *Shakspeare.*

Like Bajazet *encaged*, the shepherd's scoff,
Or like slack-sinewed Sampson, his hair off. *Donne.*

ENCAMP', *v. n.* } Fr. *camper*. From
ENCAMP'MENT. *n. s.* } en and CAMP, which see. To pitch tents, or form a camp: hence, to settle or dwell for a time.

He *encamped* at the mount of God. *Exod.* xiii. 5.

Their enemies served to improve them in their *encampments*, weapons, or something else. *Grew.*

When a general bids the martial train
Spread their *encampment* o'er the spacious plain,
Thick rising tents a canvas city build.
*Gay's Trivia.*

A feudal kingdom was properly the *encampment* of a great army; military ideas predominated, military subordination was established.
*Robertson. History of Scotland.*

Among the regulations concerning encampment, published in Britain by authority, the following are particularly to be attended to. 'On the arrival of a brigade, or a battalion, on the ground destined for its camp, the quarter and rear guards of the respective regiments will immediately mount; and, when circumstances require them, the advanced picquets will be posted. The grand guards of cavalry will be formed, and the horses picketed. The men's tents will then be pitched, and, till this duty is completed, the officers are on no account to quit their troops or companies, or to employ any soldier for their own accommodation. Necessaries are to be made in the most convenient situations, and the utmost attention is required in this, and every other particular, to the cleanliness of the camp. If circumstances will allow the ground on which a regiment is to encamp to be previously ascertained, the pioneers should make these, and other essential conveniences, before the corps arrives at its encampment. Whenever a regiment remains more than one night in a camp, regular kitchens are to be constructed. No tents, or huts, are to be allowed in front, or between the intervals of the battalions. A spot of ground for this purpose should be marked out by the quarter-master, with the approbation of the commanding officer. On arriving in a camp which is intersected by hedges, ditches, unequal or boggy ground, regiments will immediately make openings of communication, of sixty feet in width. The ground in front of the encampment is to be cleared, and every obstacle to the movement of the artillery and troops is to be removed. Commanding officers of regiments must take care that their communication with the nearest grand route is open and free from impediments.' The arrangement of tents in a camp is nearly the same all over Europe; which is, to dispose them in such a manner, that the troops may form with safety and expedition. To answer this end, the troops are encamped in the same order as that in which they are to engage the enemy, which is by battalions and squadrons; hence, the post of each battalion and squadron must necessarily be at the head of its own encampment. Gustavus Adolphus, king of Sweden, was the first who formed encampments according to the order of battle. By this disposition the extent of the camp, from right to left of each battalion and squadron, will be equal to the front of each in line of battle; and consequently, the extent from right to left, of the whole camp, should be equal to the front of the whole army when drawn up in line of battle, with the same intervals between the several encampments of the battalions and squadrons, as are in the line. Each regiment posts a subaltern's guard at eighty yards from the colors to the officer's tent, called the quarter-guard; besides a corporal's guard in the rear, called the rear-guard. Each regiment of horse or dragoons has also a small guard on foot, called the standard-guard, at the same distance. The grand guard of the army consists of horse, and is posted about a mile or a mile and a half distance towards the enemy. In a siege, the camp is placed all along the line of circumvallation, or rather in the rear of the approaches, out of cannon-shot. The army faces the circumvallation, if any, that is, the soldiers have the town in their rear. It is of great consequence, that a camp have a commodious spot of ground at its head, where the army, in case of surprise, may in a moment be under arms, and in a condition to repulse the enemy; as also, that there be a convenient field at a small distance, and of a sufficient extent to form in advantageously, and move with facility.

ENCANTHIS, in surgery, a tubercle arising either from the caruncula lachrymalis, or from the adjacent red skin; sometimes so large, as to obstruct not only the puncta lachrymalia, but also part of the sight or pupil itself. See SURGERY.

ENCARPIA, Gr. εγκαρπια, in architecture, flower-work, or fruit-work, on the corners of pillars.

ENCA'VE, *v. a.* From en and cave. To hide as in a cave.

Do but *encave* yourself,
And mark the fleers, the gibes, and notable scorns,
That dwell in ev'ry region of his face;
For I will make him tell the tale anew.
*Shakspeare.*

ENCAUSTIC PAINTING, Lat. *encausticus*; Gr. Ἐγκαυστική. The art of painting in encaustic is a manner of painting which is executed with the operation of fire. Ancient authors often make mention of this species of painting, and which, if it had been described simply by the word encaustic, which signifies executed by fire, might be supposed to have been a species of enamel painting. But the expressions encausto pingere, pictura encaustica, ceris pingere, picturam inurere, by Pliny and other ancient writers, make it clear another species of painting is thereby meant. We have no ancient pictures of this description, and therefore the precise manner adopted by the ancients is not completely developed, though many moderns have closely investigated the subject, and described their processes. At what time, and by whom, this species of painting was first invented, is not determined by antiquaries, although it appears to have been practised in the fourth and fifth centuries. Count Caylus and M. Bachelier, a painter, were the first of modern times who made experiments in this branch of art, about the year 1749. Some years after this, Count Caylus presented to the Academy of Painting at Paris his ideas and experiments on the subject of the ancient manner of painting in encaustic. In 1754 the count had a head of Minerva painted by M. Vien, after the process described by himself, and presented it to the Academy of Sciences in 1755. This success induced M. Bachelier to recommence his experiments, in which he suc-

ceeded better than formerly; but his manner of painting in encaustic differed from the ancients, as described by Pliny, and therefore he was unsuccessful, inasmuch as he did not discover the real ancient manner; after this he made some other experiments on the same subject, differing from the process as described by Caylus and others.

Pliny, in a passage relating to encaustic painting, distinguishes three species:—1st, that in which they used a style, and painted on ivory or polished wood (cestro in ebore); for which purpose they drew the outlines on a piece of the aforesaid wood or ivory, previously soaked or imbued with some certain color; the point of the style or stigma served for this operation, and the broad end to scrape off the small filaments that arose from the outlines, and they continued forming outlines with the point till they were finished. 2nd. The next manner appears to have been, where the wax previously impregnated with color was spread over the surface of the picture with the style, and the colors thus prepared were formed into small cylinders for use. By the side of the painter was a brasier for keeping the styles continually hot, with the points of which they laid on the colors when the outlines were finished, and spread them smooth with the broad end, and thus they proceeded till the picture was finished. 3rd. The manner was by painting with a pencil in wax liquefied by fire: by this method the colors contained a considerable hardness, and could not be damaged either by the heat of the sun or the deleterious effects of sea water. It was thus that they painted their ships with emblems and other pictures, and therefore it obtained the name of ship-painting. The last process was to smooth and polish the picture;—thus far the ancients.

Few of late years have made more experiments in this mode of painting than the ingenious Mrs. Hooker of Rottingdean, in the county of Sussex, who has, in this instance, united practice with theory; and, for her very successful exertions in this branch of the polite arts, was presented with a gold palette by the Society for the Encouragement of Arts, &c., of London. Her account is printed in the tenth volume of the Society's Transactions for the year 1792, when Miss Emma Jane Greenland. Her first communication with specimens of this mode of painting was made in the year 1786, one of which is preserved in the Society's rooms at the Adelphi, and is worth the attention of the artist. This honorable testimony of the society's approbation did not occasion any relaxation in this indefatigable lady's endeavour to attain excellence, and she therefore, in the year 1807, made a farther communication to the Society of the result of no less than fifty experiments per day, during more than four months; and to theory Mrs. Hooker has added much practical knowledge, having painted several pictures very successfully. The following account combines the results of this lady's two communications to the Society, which, in honor to her extraordinary merits and exertions in this curious branch of the fine arts, should be called the Hookerian mode of encaustic painting.

Method of preparing and applying a composition for painting, in imitation of the ancient Grecian manner, as practised by Mrs. Hooker: —Put into a glazed earthen vessel four ounces and a half of gum arabic, and eight ounces or half a pint (wine measure) of cold spring water: when the gum is dissolved, stir in seven ounces of gum mastich, which has been washed, dried, picked, and beaten fine. Set the earthen vessel containing the gum, water, and gum mastich, over a slow fire, continually stirring and beating them hard with a spoon, in order to dissolve the gum mastich: when sufficiently boiled it will no longer appear transparent, but will become opaque and stiff like a paste. As soon as this is the case, and the gum, water, and mastich are quite boiling, without taking them off the fire, add five ounces of white wax, broken into small pieces, stirring and beating the different ingredients together till the wax is perfectly melted and has boiled; then take the composition off the fire, as boiling it longer than necessary would harden the wax, and prevent its mixing so well afterwards with water. When the composition is taken off the fire, and in the glazed earthen vessel, it should be beaten hard, and whilst hot (but not boiling) mix with it by degrees a pint (wine measure) or sixteen ounces more of cold spring water; then strain the composition as some dirt will boil out of the gum mastich, and put it into bottles. The composition, if properly made, should be like a cream, and the colors, when mixed with it, as smooth as with oil. The method of using it is to mix with the composition, upon an earthen palette, such colors in powder as are used in painting with oil, and such a quantity of the composition to be mixed with the colors as to render them of the usual consistency of oil colors, then paint with fair water.

The colors, when mixed with the composition, may be laid on either thick or thin, as best suits your subject, on which account this composition is very advantageous where any particular transparency of coloring is required; but in most cases it answers best if the colors are laid on thick, as they require the same use of the brush as if painting with body colors, and the same brushes as used in oil painting. The colors, if grown dry when mixed with the composition, may be used by putting a little water over them; but it is less trouble to put some water when the colors are observed to be growing dry. In painting with this composition the colors blend without difficulty when wet, and even when dry the tints may easily be united by means of a brush and a very small quantity of water. When the painting is finished, put some white wax into a glazed earthen vessel over a slow fire, and when melted, but not boiling, with a hard brush cover the painting with the wax, and when cold take a moderately hot iron, such as is used for ironing linen, and so cold as not to hiss if touched with any thing wet, and draw it lightly over the wax. The painting will appear as if under a cloud till the wax and whatever substance the picture is painted upon are perfectly cold; but if when so the painting should not appear sufficiently clear, it may be held before the fire at such a distance as to melt the wax slowly; or the wax may be

melted by holding a hot poker at such a distance as to melt it gently, especially over such parts of the picture as should not appear sufficiently transparent or brilliant: for the oftener heat is applied to the picture the greater will be the transparency and brilliancy of coloring; but the contrary effect would be produced if too sudden or too great a degree of heat is applied, or for too long a time, as it will draw the wax too much to the surface, and may likewise crack the paint. Should the coat of wax put over the painting when finished appear in any part uneven, it may be remedied by drawing a moderately hot iron over it again as before mentioned, or even by scraping the wax with a knife; and should the wax, by too great or too long an application of heat, form into bubbles at particular places, by applying a poker heated, or even a tobacco pipe made hot, the bubbles will subside; or such defects may be removed by drawing any thing hard over the wax, which will close any small cavities. When the picture is cold rub it with a fine linen cloth. Paintings may be executed in this manner upon wood, having first pieces of wood let in behind, across the grain of the wood, to prevent its warping, canvas, card, or plaster of Paris. The plaster of Paris requires no other preparation than mixing some fine plaster of Paris in powder with cold water the thickness of cream; then put it on a looking-glass, having first made a frame of bees'-wax on the looking-glass, the form and thickness of which you wish the plaster of Paris to be, and when dry take it off, and there will be a very smooth surface to paint upon. Wood and canvas are best covered with some gray tint mixed with the same composition of gum arabic, gum mastich, and wax, and of the same sort of colors as before mentioned, before the design is begun, in order to cover the grain of the wood, or the threads of the canvas. Painting also may be done in the same manner with only gum water and gum mastich prepared the same way as the mastich and wax; but instead of putting seven ounces of mastich, and, when boiling, adding five ounces of wax, mix twelve ounces of gum mastich with the gum water, prepared as mentioned in the first part of this receipt: before it is put on the fire, and when sufficiently boiled and beaten, and a little cold, stir in by degrees twelve ounces, or three-quarters of a pint, wine measure, of cold spring water, and afterwards strain it. It would be equally practicable to paint with wax alone, dissolved in gum water in the following manner. Take twelve ounces, or three-quarters of a pint, wine measure, of cold spring water, and four ounces and a half of gum arabic, put them into a glazed earthen vessel, and, when the gum is dissolved, add eight ounces of white wax. Put the earthen vessel, with the gum water and wax, upon a slow fire, and stir them till the wax is dissolved and has boiled a few minutes; then take them off the fire, and throw them into a basin, as by remaining in the hot earthen vessel the wax would become rather hard; beat the gum water and wax till quite cold. As there is but a small proportion of water, in comparison to the quantity of gum and wax, it would be necessary, in mixing this composition with the colors, to put also some fair water. Should the composition be so made as to occasion the ingredients to separate in the bottle, it will become equally serviceable if shaken before used to mix the colors.

Another very serviceable quality in the vehicle for painting was discovered by Mrs. Hooker, which was, that the composition which had remained in a bottle since the year 1792, in which time it had grown dry and become as solid a substance as wax, returned to a cream-like consistence, and became again in as proper a state to mix with colors as when it was first made, by putting a little cold water upon it, and suffering it to remain on a short time. 'I also lately found,' says this ingenious lady, 'some of the mixture composed of only gum arabic water and gum mastich, of which I sent a specimen to the Society of Arts in 1792; it was become dry, and had much the appearance and consistency of horn. I found, on letting some cold water remain over it, that it became as fit for painting with as when the composition was first prepared.'

J. Chr. Werner, of Newstadt, in Germany, found the following process very effectual in making wax soluble in water:—For each pound of white wax he takes twenty-four ounces of potassa, which he dissolves in two pints of water, warming it gently. In this lie he boils the wax, cut into little bits, for half an hour; at the end of this time he takes it from the fire and lets it cool. The wax fixes itself at the surface of the liquor in the form of a white saponaceous matter, which, being triturated with water, produces a sort of emulsion which he called wax milk, or encaustic wax, and may be applied to pictures, furniture, or leather, after having well cleaned them: in an hour after the application the article should be rubbed with a piece of woollen cloth, which will cause the pictures to have a better effect, and the furniture to acquire a peculiar brightness. Another advantage of this preparation of wax is, that it can be mixed with all kinds of colors, and consequently be applied in a single operation. It is also useful to fix water colors.

The following important observations are translated from the Italian of the chevalier Lorgna, who has deeply investigated the subject, in a small but valuable tract called, Un Discorso sulla Cera Punica. The ancients, says this author, according to Pliny, used three species of painting, and in all three they used fire; so that to paint with encaustic, or with a burning application, abbrucciamento, is derived from a Greek word.

We have never thoroughly known the nature of the Punic wax, which was anciently used, and which, after all, was the essential ingredient of the ancient painting in encaustic. The chevalier praises the genius and industry of M. Requeno and M. Bachelier, who have also treated this subject, but who have not fully succeeded in finding out the true way of making the said wax, then quotes the passage of Pliny on the method of making it, Punica fit hoc modo, &c. see Pliny's Nat. Hist. l. 21, c. 14, and asserts, with many other writers, that Pliny's nitre is not the nitre of the moderns, properly so called, but it

is the natron of the ancients, viz. the native salt which is found crystallised in Egypt and other hot countries, in sands surrounding lakes of salt water; it must not be mistaken for the natron of the new nomenclature of our college of physicians, which is the new name of the mineral alkali.

In the plains of Lower Egypt, which were once covered by the sea, in the environs of the salt lakes of that country, at Tripoli, at Tunis, as also in the adjacent parts of ancient Carthage, the natron, that same natron which, under the name of nitre, the Carthagin ans, according to Pliny, used in preparing their wax, is to this day extracted, and hence it was called Punic wax.

I began now, says Lorgna, successively to try my experiments, first with three parts of wax and one of natron, and then with four of wax, and so on till I used twenty parts of white melted wax with one only of natron, with as much water as was just sufficient to melt the natron. I held the mixture in an iron vessel over a slow fire, stirring it gently with a wooden spatula, till the two substances thickened by evaporation, and, in closely uniting, the mass by degrees assumed the consistence of butter, and the color of milk. I removed it then from the fire, and put it in the shade to let it harden, and to perfect itself in the open air. This natron was extracted from the lie of kali of Malta, evaporated till it was dry; it may also be extracted from the kali of Spain, Sicily, Sardinia, and from that of Tunis and of Tripoli, which may be procured without much difficulty. The wax being cooled it liquefied in water, and a milky emulsion resulted from it like that which could be made with the best Venetian soap.

Pliny, in another place, c. 7, l. 23, gives further directions for the manner of using caustic on paintings on walls; but, as it concerns the antiquary more than the artist, I have forborne from making the quotation. It begins at these words, 'Ut parietis siccato cera Punica,' &c.

As to making use of this wax in painting in encaustic the chevalier says, that magnificent and repeated experiments were made in the apartments of the Count Giovanni Battista Gasola, by the Italian painter Signor Antonio Paccheri. He dissolved the Punic wax, when it was not yet so much hardened as to require to be igni resoluta, as expressed by Pliny, with pure water lightly infused with gum arabic, instead of sarcocolla, male incense, mentioned by Pliny. He afterwards melted and mixed his colors with this wax so liquefied as he would have done with oil, and proceeded to paint in the same manner; nor were the colors seen to run or alter in the least; and the mixture was so flexible that the pencil ran smoother with it than it would have done with oil. The painting being dry, he used the caustic over it, and rubbed it with linen cloths, by which the colors acquired a peculiar vivacity and brightness which they had not before the caustic and the rubbing had been effected.

ENCEINTE, *n. s.* Fr. *enceinte*; Lat *incingo*, to enclose. In fortification, is the interior wall or rampart which surrounds a place, sometimes compos d of bastions or curtains, either faced or lined with brick or stone, or only made of earth. See ENSIENT.

The *enceinte* is sometimes only flanked by round or square towers, which is called a Roman wall. *James.*

ENCEN'IA, *n. s.* plural. Gr. εγκαινια (καινος, new). Festivals in celebration of the founding of certain temples or public places. See the following article.

Besides those verses in the Oxford books, which he could not help setting his name to, several of his compositions came abroad under other names. The *Encænia*, and public Collections of the University upon State Subjects, were never in such esteem, either for elegy or congratulation, as when he contributed most largely to them. *Johnson's Life of Smith.*

ENCENIA. These were festivals anciently kept in honor of the building of certain cities or great towns. The Jews kept one on the day on which the temple was dedicated, and the Christians thus celebrated the consecration of their churches. At Oxford it has signified in modern times the ceremonies and solemnities instituted in honor of founders or benefactors of colleges.

ENCHA'FE, *v. a.* Fr. *eschauffer*. To enrage; to irritate; to provoke.

The wind-shaked surge, with high and monstrous main,
Seems to cast water on the burning bear,
I never did like molestation view
On the *enchafed* flood. *Shakspeare. Othello.*

ENCHAIN'. Fr. *enchainer*, from en and CHAIN, which see. To chain or fasten together: hence, to bind; hold under power; subject.

The one contracts and *enchains* his words, speaking pressingly and short; the other delights in long-breathed accents. *Howel.*

What should I do! while here I was *enchained*,
No glimpse of god-like liberty remained. *Dryden.*

ENCHANT', *v. a.*
ENCHANT'ER, *n. s.*
ENCHANT'ING, *adj.*
ENCHANT'INGLY, *adv.*
ENCHANT'MENT, *n. s.*
ENCHANT'RESS, *n. s.* fem.

Fr. *enchanter*; Span. *encantar*; Ital. and Lat. *incantare*, from *in* and *canto*, to sing, because magical charms were often composed in verse, and sung by the enchanter. To influence or subdue by charms or spells: hence, to delight extremely; to enrapture; the derivations all follow one or other of these senses.

The Turks thought that tempest was brought upon them by the charms and *enchantments* of the Persian magicians. *Knolles.*

And now about the cauldron sing,
Like elves and fairies in a ring,
*Enchanting* all that you put in. *Shakspeare.*
Fell banning hag! *enchantress*, hold thy tongue. *Id.*

One whom the music of his own vain tongue
Doth ravish like *enchanting* harmony. *Id.*

He's gentle; never schooled, and yet learned, full of noble device; of all sorts *enchantingly* beloved. *Id.*

If the king had not been persuaded of the strength of his charm, he had not sent so far, and paid so dear for it; now he trusts more to his *enchantment*, than to the forces of Moab and Midian. *Bp. Hall. Contemplations.*

These powerful drops thrice on the threshold pour,
And bathe with this *enchanted* juice her door;

That door where no admittance now is found,
But where my soul is ever hovering round. *Gran.*

Arcadia was the charmed circle, where all his spirits for ever should be *enchanted*. *Sidney.*

From this *enchantress* all these ills are come ;
You are not safe 'till you pronounce her doom. *Dryden.*

I have it by certain tradition, that it was given to the first who wore it by an *enchantress*. *Tatler.*

Such phasms, such apparitions, are excellencies which men applaud in themselves, conjured up by the magick of a strong imagination, and only seen within that circle in which the *enchanter* stands. *Decay of Piety.*

Gladio, by valour and stratagem, put to death tyrants, *enchanters*, monsters, and knights. *Spectator.*

John thinks them all *enchanted* : he enquires if Nick had not given them some intoxicating potion. *Arbuthnot.*

Warmth of fancy will carry the loudest and most universal applause, which holds the heart of a reader under the strongest *enchantment*. *Pope.*

Too dear I prized a fair *enchanting* face ;
Beauty unchaste is beauty in disgrace. *Id.*

Oft with the *enchantress* of his soul he talks,
Sometimes in crowds distressed. *Thomson.*

This life, sae far's I understand,
Is a' *enchanted* fairy land,
Where pleasure is the magic wand,
That, wielded right,
Makes hours like minutes, hand in hand,
Dance by fu' light. *Burns.*

Perhaps loose Luxury's *enchanting* smile
Shall lure my steps to some romantic dale,
Where Mirth's light freaks the' unheeded hours beguile,
And airs of rapture warble in the gale. *Beattie.*

ENCHASE, *v. a.* Fr. *enchasser* ; the same originally with encase ; Gr. εν and καψα, a chest. Originally to enclose one body within another ; to insert in ornamented cases, and to emboss or engrave ornaments ; and hence, to ornament, adorn generally.

What seest thou there ? King Henry's diadem,
*Enchased* with all the honours of the world !
*Shakspeare.*

When was old Sherewood's head more quaintly curled,
Or looked the earth more green upon the world,
Or nature's cradle more *enchased* and purled ?
*Ben Jonson.*

And yet no doubts the poor man's draught controll ;
He dreads no poison in his homely bowl :
Then fear the deadly drug, when gems divine
*Enchase* the cup, and sparkle in the wine. *Dryden.*

Like polished iv'ry, beauteous to behold ;
Or Parian marble, when *enchased* in gold. *Id.*

Words, which, in their natural situation, shine like jewels, *enchased* in gold, look, when transposed into notes, as if set in lead. *Felton.*

ENCHEA'SON, *n.s.* Old law. Fr. *encheason.* Cause ; occasion.

And for this *encheason* the prince was, in the life of his father, sente thither, to the ende that the authoritie of his presence should refraine euill disposed parsons fro the baldness of their former outerages. *Sir T. More.*

Certes, said he, well mote I should to tell
The fond *encheason* that me hither led.
*Faerie Queene.*

ENCHIRI'DION, *n. s.* Lat. *enchiridium* ; from Gr. εν and χειρ, the hand. A small book (which one may carry in the hand) ; a manual.

Erasmus I take to have written the most and best that ever man wrote ; yet almost all were first sent abroad in very few sheets, or small *enchiridions.* *Boyle.*

ENCIR'CLE, *v. a.* } Old French, *encercler*,
ENCIRCLET, *n. s.* } from en and CIRCLE, which see. To surround ; environ. Encirclet, is a ring ; a circle.

In whose *encirclets* if ye gaze,
Your eyes may tread a lover's maze. *Sidney.*

That stranger guest the Paphian realm obeys,
A realm defended with *encircling* seas. *Pope.*

*Encircled* in her clasping arms,
How have the raptured moments flown !
How have I wished for fortune's charms,
For her dear sake, and her's alone ! *Burns.*

He spoke,—to Heaven his arms repentant spread,
And kneeling bowed his gem-*encircled* head.
*Darwin.*

Lo ! where the stripling, wrapt in wonder, roves
Beneath the precipice o'erhung with pine
And sees, on high, amidst the' *encircling* groves,
From cliff to cliff the foaming torrents shine :
While waters, woods, and winds, in concert join,
And Echo swells the chorus to the skies. *Beattie.*

ENCLASP, *v. a.* From en and clasp. To clasp ; embrace.

When shall my soul, in silent peace,
Resign life's joyless day ;
My weary heart its throbbings cease,
Cold mouldering in the clay ?
No fear more, no tear more,
To stain my lifeless face ;
*Enclasped*, and grasped
Within thy cold embrace ! *Burns.*

ENCLI'TES, *n. s.* } Gr. εγκλιτικα of εγ-
ENCLIT'IC, *adj.* } κλινω, I incline. Parti-
ENCLIT'ICS, *n. s.* } cles which throw back the accent upon the foregoing syllable.

It is observed too often, that men of wit do so much employ their thoughts upon fine speculations, that things useful to mankind are wholly neglected, and they are busy in making emendations upon some *enclites* in a Greek author, while obvious things, that every man may have use for, are wholly overlooked. *Addison.*

There are three *enclitic* particles in the Latin, viz. que, ne, and ve ; but in the Greek many, as τε, μεν, μοι, με, σε, σοι, σῃ, πως, πη, τε, γε, φημι, ειμι, ποτε, and others. *Dr. A. Rees.*

ENCLOSE, *v. a.* } Fr. *enclorre* ; Lat. *in-*
ENCLO'SER, *n. s.* } *cludo* ; i. e. *in* and *claudo*,
ENCLO'SURE. } *clausus*, to shut up. From en and close. To environ ; surround ; encircle ; hence to part off from other things or property ; to appropriate. Enclosure is the act of enclosing or separating off ; the state of being, and the space or ground enclosed.

The fourth row a beryl, and an onyx, and a jasper they shall be set in gold in their *enclosings.* *Ex.* xxviii. 20.

And all, that else this world's *enclosure* base
Hath great or glorious in mortal eye,
Adorns the person of her Majesty. *Faerie Queene.*

*Enclosures* began to be frequent, whereby arable land was turned into pasture. *Bacon's Henry VII.*

The protector caused a proclamation to be set forth against *enclosures*, commanding, that they who had *enclosed* lands, accustomed to lie open, should lay them open again. *Hayward.*

If God had laid all common, certainly
Man would have been the' *encloser*; but since now
God hath impaled us, on the contrary,
Man breaks the fence. *Herbert*

Let no man appropriate what God hath made common; that is against justice and charity, and by miraculous accidents God hath declared his displeasure against such *enclosure*. *Taylor.*

The membranes are for the comprehension or *enclosure* of all these together. *Wilkins.*

As much land as a man tills, and can use the product of, so much he by his labour *encloses* from the common. *Locke.*

For the young, during its *enclosure* in the womb, there are formed membranes inveloping it, called secundines. *Ray.*

This expresses particularly the *enclosure* of the waters within the earth. *Burnet's Theory.*

'Tis not the common, but the *enclosure* must make him rich. *South.*

They are to live all in a body, and generally within the same *enclosure*; to marry among themselves, and to eat no meats that are not prepared their own way. *Addison's Spectator.*

For *enclosing* of land, the usual way is with a bank set with quick. *Mortimer's Husbandry.*

The peer now spreads the glittering forfex wide,
T' *enclose* the lock; now joins it, to divide. *Pope.*

Then snug *enclosures* in some sheltered spot,
Where frequent hedges intercept the eye,
Delight us, happy to renounce awhile,
Not senseless of its charms, what still we love,
That such short absence may endear it more.
*Cowper.*

ENCO'MIUM, *n. s.*
ENCO'MIAST,
ENCO'MIASTIC, *adj.*
ENCOMIAS'TICAL.
Gr. εγκωμιον, from the verb εγκωμιαζω to praise. Panegyric; praise. An encomiast, he who speaks or proclaims praise. Encomiastic, encomiastical; laudatory, panegyrical.

The Jesuits are the great *encomiasts* of the Chinese. *Locke.*

How eagerly do some men propagate every little *encomium* their parasites make of them! *Government of the Tongue.*

A vile *encomium* doubly ridicules;
There's nothing blackens like the ink of fools. *Pope.*

ENCOM'PASS, *v. a.*
ENCOM'PASSMENT, *n. s.*
From en and COMPASS, which see. To surround; enclose; move round; encircle.

Look how my ring *encompasseth* thy finger;
Ev'n so thy breast encloseth my poor heart.
*Shakspeare.*

Finding
By this *encompassment* and drift of question,
That they do know my son, come you more near.
*Id.*

Two strong ligaments *encompass* the whole head of the femur. *Wiseman's Surgery.*

Poetic fields *encompass* me around,
And still I seem to tread on classic ground.
*Addison.*

Onward sweeps the rolling host!
Heroes of the' immortal boast!
Mighty Chiefs! Eternal shadows!
First flowers of the bloody meadows
Which *encompass* Rome, the mother
Of a people without brother! *Byron.*

Lest, thus *encompassed* with funereal gloom,
Like me, ye bend o'er some untimely tomb,
Pour your wild ravings in Night's frighted ear,
And half pronounce heaven's sacred doom severe.
*Beattie.*

ENCO'RE, *adv.* French. Again; once more. 'A word used at public shows when a singer, or fiddler, or buffoon, is desired by the audience to do the same thing again.'—Dr. Johnson. We have retained this singular definition of our great lexicographer, written, as it would seem, when he was disappointed of some compliment of this kind. This adverb, however, has become the parent of a verb; see the instance.

To the same notes thy sons shall hum or snore,
And all thy yawning daughters cry *encore*.
*Dunciad.*

Dolly, in her master's shop,
*Encores* them as she twirls her mop.
*Whitehead.*

ENCOUNT'ER, *v. a.*, *v. n.* & *n. s.*
ENCOUNT'ERER, *n. s.*
Fr. *encontre*; Spanish and Port. *encontrar*, from Latin, *in*, and *contra*, against; opposite. To engage or run against; to meet front to front, or in opposition; applied to casual as well as premeditated conflicts.

The lion will not kick with his feet, but he will strike such a stroke with his tail, that he will break the back of his *encounterer* with it. *More.*

Putting themselves in order of battle, they *encountered* their enemies. *Knolles's History of the Turks.*

I am most fortunate thus to *encounter* you:
You have ended my business, and I will merrily
Accompany you home. *Shakspeare. Coriolanus.*

*Encounter* so,
As doth the fury of two desperate men,
Which, in the very meeting, fall and die. *Id.*
Our wars
Will turn into a peaceful comic sport,
When ladies crave to be *encountered* with. *Id.*

See they *encounter* thee with their hearts' thanks;
Both sides are even. *Id. Macbeth.*

Oh these *encounterers*! so gilt of tongue,
They give a coasting welcome ere it comes;
And wide unclasp the tables of their thoughts
To every ticklish leader. *Id. Troilus and Cressida.*

Two black clouds
With heaven's artillery fraught, come rattling on
Over the Caspian; then stand front to front,
Hov'ring a space, 'till winds the signal blow
To join their dark *encounter* in mid air. *Milton.*

Jurors are not bound to believe two witnesses, if the probability of the fact does reasonably *encounter* them. *Hale.*

As many as are the difficulties which virtue has to *encounter* in this world, her force is yet superior. *Shaftesbury.*

Which way soever we turn, we are *encountered* with clear evidences and sensible demonstrations of a Deity. *Tillotson.*

Thou stronger may'st endure the flood of light,
And, while in shades I chear my fainting sight,
*Encounter* the descending excellence. *Dryden.*

Pallas the' *encounter* seeks; but ere he throws
To Tuscan Tiber thus addressed his vows:
O sacred stream, direct my flying dart,
And give to pass the proud Halesus' heart. *Id.*

The doctrines of the reformation have kept the field against all *encounterers*. *Atterbury.*

Those who have the most dread of death, must be content to *encounter* with it, whether they will or no. *Wake.*

Propitious Pallas, to secure her care,
Around him spread a veil of thickened air,
To shun the' *encounter* of the vulgar crowd. *Pope.*

An equality is not sufficient for the unity of character; 'tis further necessary, that the same spirit appear in all sorts of *encounters*. *Id.*

O! shun, ye noble train
The rude *encounter*, and believe your lives
Your country's due alone. *Somervile.*

ENCOUR'AGE, *v. a.*
ERCOUR'AGEMENT, *n, s.*
ENCOUR'AGER.
Fr. *encourager*; Ital. *incorragiare*, a compound of en and courage. To inspirit; embolden; animate with courage or strength.

They *encourage* themselves in an evil matter. *Ps.* lxiv. 5.

Kinds of musick *encourage* men and make them warlike, or make them soft and effeminate. *Bacon.*

I would neither *encourage* the rebels, nor discourage the protestants' loyalty. *King Charles.*

Where art is *encouraged* it will soon rise high, and go far; and not suffer a channel of the sea to stay it from the presence of a more bountiful patronage. *Bp. Hall.*

For when he dies, farewel all honour, bounty,
All generous *encouragement* of arts. *Otway's Orphan.*
Live then, thou great *encourager* of arts,
Live ever in our thankful hearts. *Dryden.*

But, on the contrary, his own confession, bringing always with it perfect impunity, should be, besides, *encouraged* by some marks of approbation. *Locke.*

As the pope is a master of polite learning, and a great *encourager* of arts; so at Rome these arts immediately thrive, under the *encouragement* of the prince. *Addison.*

Such strength of heart
Thy conduct and example gives; nor small
*Encouragement* Godolphin, wise and just. *Philips.*

The reproach of immorality will lie heaviest against an established religion, because those who have no religion will profess themselves of that which has the *encouragement* of the law. *Rogers.*

Genuine Christianity is distinguished above all other religions by the mildness of its spirit; the enemy of every practice which hardens the heart; the *encourager* of every virtue which renders the character humane. *Robertson. Sermons.*

C. SURF. To be sure, I once thought the lady seemed to have taken a fancy to me; but, upon my soul, I never gave her the least *encouragement*:—besides, you know my attachment to Maria. *Sheridan.*

Planters of trees ought to *encourage* themselves, by considering all future time as present; indeed, such consideration would be a useful principle to all men in their conduct of life, as it respects both this world and the next. *Bp. Watson.*

The day before, fast sleeping on the water,
They found a turtle of the hawk's-bill kind,
And by good fortune, gliding softly, caught her,
Which yielded a day's life, and to their mind
Proved even still a more nutritious matter,
Because it left *encouragement* behind: *Byron.*

ENCRATITÆ, or ENCRATITES, in church history, heretics who appeared towards the close of the second century; they were called Encratites, or Continents, because they gloried in abstaining from marriage and the use of wine and animal food.

ENCROACH', *v. a., v. n. & n. s.*
ENCROACH'ER, *n. s.*
ENCROACH'MENT.
Fr. *accrocher*; Spanish, *corchetar*; from French, *croc*, and Spanish, *corchete*, a hook. To draw away or seize another's possessions: hence, as a neuter verb, to creep on gradually; to pass bounds; generally applied to the gradual invasion of another's right; taking *on* before the subject.

Those Irish captains of counties have *encroached* upon the queen's freeholders and tenants. *Spenser.*

The superstition that riseth voluntarily, and by degrees mingleth itself with the rites, even of every divine service, done to the only true God, must be considered of as a creeping and *encroaching* evil. *Hooker.*

This hour is mine; if for the next I care, I grow too wide,
And do *encroach upon* death's side. *Herbert.*

They fabled how the serpent, whom they called
Ophion, with Eurynome, the wide
*Encroaching* Eve perhaps, had first the rule
Of high Olympus. *Milton's Paradise Lost.*

But this usurper his *encroachment* proud
Stays not on man: to God his tower intends
Siege and defiance. *Id.*

Tisiphone, let loose from under gronnd,
Before her drives diseases and affright;
And every moment rises to the sight,
Aspiring to the skies, *encroaching on* the light. *Dryden.*

As a man had a right to all he could employ his labour upon, so he had no temptation to labour for more than he could make use of: this left no room for controversy about the title, nor for *encroachment* on the right of others. *Locke.*

The ancient Romans made many *encroachments* on the sea, and laid the foundations of their palaces within the very borders of it. *Addison on Italy.*

The bold *encroaches* on the deep
Gain by degrees huge tracts of land,
Till Neptune with one general sweep,
Turns all to barren strand. *Swift.*

Intrigue and refinement were feeble fences against the *encroachments* of military power. *Robertson. History of Scotland.*

As Envy pines at good possessed,
So Jealousy looks forth distressed
On good that seems approaching;
And, if success his steps attend,
Discerns a rival in a friend,
And hates him for *encroaching*. *Cowper.*

Such dire *encroachments* to prevent in time,
Demands the critic's voice—the poet's rhyme,
Can our light scenes add strength to holy laws? *Sheridan.*

His empire also was without a bound—
'Tis true, a little troubled here and there,
By rebel pachas, and *encroaching* giaours,
But then they never came to 'the Seven Towers.' *Byron.*

ENCUM'BER, *v. a.*
ENCUM'BERMENT, *n. s.*
ENCUM'BRANCE, *n. s.*
Fr. *encombrer*; It. *ingombrare*; from en and CUMBER, which see. To impede; clog; accumulate difficulties; hence to embarrass; burden: encumbrance is an impediment, load, excrescence or useless addition.

Much was the man *encombred* with his hold,
In feare to lose his weapon in his paw,
Ne wist yett how his talaunts to unfold. *Spenser. Faerie Queene.*

The best advizement was of bad, to let her
Sleepe out her fill without *encomberment*,
For sleepe, they sayd, would make her battill better.
*Id.*

We have, by this many years' experience, found that exceeding great good, not *encumbered* with any notable inconvenience. *Hooker.*

Philosophers agreed in despising riches, at best considering them as unnecessary *encumbrances* of life. *Temple.*

*Encumbered* with his vest, without defence. *Dryden.*

Dead limbs are an *encumbrance* to the body, instead of being of use to it. *Addison's Freeholder.*

The god awaked,
And thrice in vain he shook his wing,
*Encumbered* in the silken string. *Prior.*

In respect of the *encumbrances* of a living, consider whether it be sufficient for his family, and to maintain hospitality. *Ayliffe.*

Strip from the branching Alps their piny load,
The huge *encumbrance* of horrifick woods. *Thomson.*

The rose had been washed, just washed in a shower,
Which Mary to Anna conveyed,
The plentiful moisture *encumbered* the flower,
And weighed down its beautiful head. *Cowper.*

Here wealth had done its utmost to *encumber*
With furniture an exquisite apartment,
Which puzzled nature much to know what art meant.
*Byron.*

ENCY'CLICAL, *adj.* Ἐγκυκλικός. Circular; sent round through a large region.

This council was not received in patriarchal sees, which is evident from Photius's *encyclical* epistle to the patriarch of Alexandria. *Stillingfleet*

ENCYCLOPÆ'DIA, *n. s.* } Fr. *encyclopedie*; Gr. ἐγκυκλοπαιδεια, from εν, κυκλος, a circle, and παιδεια, science.
ENCYCLOPÆ'DY,
ENCYCLOPÆ'DIST.
The circle of the sciences: a system of knowledge or learning. An encyclopædist is a writer in, or conductor of, an encyclopædia.

In this *encyclopædia* and round of knowledge, like the great wheels of heaven, we must observe two circles, that while we are daily carried about, and whirled on by the swing and rapt of the one, we may maintain a natural and proper course in the sober wheel of the other. *Browne's Vulgar Errours.*

Every science borrows from all the rest, and we cannot attain any single one without the *encyclopædy*. *Glanville.*

This art may justly claim a place in the *encyclopædia*, especially such as serves for a model of education for an able politician. *Arbuthnot.*

It became the only resource of the reader,—to have recourse to Chambers's Dictionary;—or to the still more stupendous performance of the French *encyclopedists*. *Dr. Hutton.*

ENCYCLOPÆDIA, a term nearly synonymous with Cyclopædia, but preferred to it as more expressive, in denominating the present work. The late learned printer, Mr. Bowyer, justly observes, that the preposition en makes the meaning of the word more precise: for cyclopædia may denote 'the instruction of a circle,' as Cyropædia is 'the instruction of Cyrus,' whereas in encyclopædia the preposition determines the word to be from the dative of cyclus, 'instruction in a circle.' And Vossius, in his book De Vitiis Sermonis, has observed, 'that cyclopædia is used by some authors, but encyclopædia by the best.'

We have pledged ourselves to give some account of the principal works of this kind which have appeared in our language. If we advert to an earlier work or two, in other languages, it will not, we apprehend, be unacceptable to our readers.

The first work, then, to which this designation was expressly given, appears to be that of Alfarabius, an Arabian writer of the school of Bagdad, in the tenth century. It is described by Casiri (Bibliotheca Arabico-Hispana Escurialensis) in his account of the Arabian authors of this period, as a work 'ubi Scientiarum Artiumque liberalium Synopsis occurrit, unà cum accurata et perspicua earum notitiâ, definitione, divisione, methodo.' A complete list of the encyclopædias of the fifteenth and sixteenth centuries is to be found in the Bibliotheca Realis Philosophica of Lipenius, tom. i. pp. 436-7. These works rather aimed at a systematic digest of science in a series of systems, more or less comprehensive, than at embracing the whole circle of knowledge and miscellaneous literature. The most important among the early works of this kind was the Encyclopædia of J. H. Alstedius, professor of philosophy at Weissembourg, and which first appeared in 1620. It is mentioned with approbation by Leibnitz nearly a century after its appearance. The second edition, in two large volumes, folio (1630), is divided into thirty-five books. Books i. to iv. are introductory, and contain sketches of the studies and pursuits requisite to the understanding of the rest. Books v. to x. are on Philology. Books xi. to xx. on Speculative; and books xxi. to xxiv. on Practical Philosophy; xxv. xxvi. and xxvii. embrace the subjects, Theology, Jurisprudence, and Medicine; xxviii. xxix. xxx. the Mechanical Arts; and xxxi. xxxii. xxxiii. xxxiv. xxxv. History, Chronology, and Miscellanies. For an early work of this kind there is certainly great merit and comprehensiveness in this arrangement. But none of the encyclopædias had hitherto attempted an alphabetical digest of science.

This was first given to the world by Dr. Harris, under the title of a Lexicon Technicum, or Universal Dictionary of the Arts and Sciences, explaining not only the Terms of Art, but the Arts themselves, Lond. 1710; and which became the foundation, in fact, of all the succeeding works of this nature. Still it was restricted, principally, to the physical and mathematical sciences.

The Cyclopædia of Chambers, which appeared in 1728, was the earliest attempt to arrange the whole compass of human knowledge in an alphabetical form. His plan was complicated, but indicative of great mental powers in the author, and considerable research. He did not attempt to exhibit every science as a perfect whole, or in one treatise: but first laying down for his guidance a detailed scheme of all the various branches of knowledge (which he prefixes to his work), he gave each branch or ramification of science the explanation it seemed to him to require, and depended upon an extensive system of references, from one to the other, to establish their unity. In his preface,

which has been much admired, he thus concludes:—

'The ultimate view of a work of this kind should be the forming of a *sound mind*, i. e. acquiring a system of perceptions and motions agreeing to the system of things, or in the relations thereto intended by its author. The end of learning and study is not the filling of our heads with other men's ideas; that is an enrichment which may prove for the worse: richness is only a matter of secondary consideration; soundness is the first. There are many manures which the husbandman dares not use by reason they would corrupt the land, at the same time they enriched it, and lay the foundation of a disease which would in the end impoverish, and make it spend itself in unprofitable weeds.

'But it must be owned, men's heads are not so easily filled; the memory is not so tenacious as we may imagine; ideas are transient things, and seldom stay long enough with us to do either much good or harm: ten to one but what we read to-day is most of it forgot again to-morrow. And what chiefly makes new ideas of any significancy is their extending and enlarging the mind, and making it more capacious and susceptible. But neither is this enlargement the last aim; but is chiefly of use, as it contributes to the increasing our sensibility, to the making our faculties more subtle and adequate, and giving us a more exquisite perception of things that occur; and thus enabling us to judge clearly, pronounce boldly, conclude readily, distinguish accurately, and to apprehend the manner and reasons of our decisions. To which end several things may conduce that are not so much direct matters of knowledge as collateral to it; for instance, much of the school-philosophy, which, by exercising and exciting the mind, has a kind of instrumental tendency to sharpen its faculties, and needs only be read, not retained, to produce its effects.

'But even this does not amount to the full and adequate end of knowledge: this is only improving the organ; and there must be some farther end in such improvement. No man sharpens his weapon on the sole consideration of having it sharp, but to be the fitter for *use*. Briefly then, our faculties being only so many inlets whereby, and according to the measure whereof, we receive intimations of the Creator's will, and the effects of his power and action, all the improvements made in them have a tendency to subject us more entirely to His influence and direction; and thus make us conspire, and move more in concert with the rest of His works, to accomplish the great end of all things, in which our happiness and perfection consists; the perfection of a single nature arising in proportion as it contributes to that of the universe.'

Chambers's Cyclopædia consisted of two folio volumes, of which five editions were published in eighteen years. A supplement, consisting also of two volumes, folio, edited, and chiefly compiled by Dr. Hill, was published in 1754. The late Dr. Abraham Rees it is well known became the final editor of this work, and extended it, in the great undertaking of this kind to which he devoted almost twenty years of his life,—'measured,' as he tells us, 'not by fragments of time, but by whole days of twelve or fourteen hours,' to the unparallelled length of thirty-nine 4to. volumes,—unparalleled, of course, we mean, in an English work of this kind. As we have commenced with a criticism on the comparative propriety of the two leading terms of our title and his, it appears but just to extract Dr. Rees' defence of the one he adopted.

'The word cyclopædia is not of classical authority, though frequent enough among modern writers, to have got into several of our dictionaries. Some have censured us for having called the present work by this name; not considering that names and titles of books, engines, instruments, &c., are in a great measure arbitrary; and that authors make no scruple even of coining new words on such occasions, when there are no old ones to their mind. Thus it is Dr. Hooke calls his fine book of microscopical observations, Micrographia; Wolfius his book on the air, Aerometria; Drake, his book of anatomy, Anthropologia, &c.; all of them words of modern, if not of their own fabric; and on no better authority stand the names of half our later inventions, as microscope, telescope, barometer, thermometer, micrometer, &c. But it is suggested, the word cyclopædia is ambiguous, and may denote the science of a circle, as well as the circle of sciences; we answer, that as custom, the only sovereign rule of language, has determined the word to the latter sense, it is no more chargeable with ambiguity than a thousand other words of received use; no more, for instance, than micrometer, which might either denote a little measure, or a measure of little things.' *Rees' Cyclopædia, Article* CYCLOPÆDIA.

Various Universal Dictionaries of the Arts and Sciences appeared in the middle of the last century; as that of Barrow, in 2 vols. fol. 1751 and 1754, containing a bad translation of D'Alembert's Preliminary Discourse to the French Encyclopedie; Owen's New and Complete Dictionary of Arts and Sciences, 4 vols. large 8vo. 1754; the Complete Dictionary of Arts and Sciences, edited by a Dr. T. Williams, Rev. Henry Croker, &c.; and a Universal History of Arts and Sciences, or a Comprehensive Illustration of all Sciences and of all Arts, by Dr. De Coetlogon, 2 vols. fol. 1745: this latter work, it appears furnishing the first hint of the plan of the Encyclopædia Britannica. In the mean time a translation of Chambers's Cyclopædia in France suggested to the booksellers of that country the idea of the celebrated Encyclopedie of D'Alembert and Diderot.

The Encyclopædia Britannica was from the first distinguished by its method of giving all the principal sciences in distinct and considerable treatises; and, while its execution was at this period inferior, the superiority, as it has been thought, of its plan, obtained for it increasing popularity throughout all its editions. The first consisted of only 3 vols. 4to. and was completed in 1771; the second extending to 10 vols. 4to. appeared between 1778 and 1783, and included two subjects not hitherto embraced in any modern work of the kind (at the sug-

gestion, it is said, of the duke of Buccleugh), biography and history. The third edition, in 18 vols., received the important aid and large contributions to its physical science, by Professor Robison, and was edited by Mr. Colin, Macfarquhar, and the present bishop Gleig. A fourth, fifth, and sixth edition of this work have since appeared with minor improvements, and extending it to 20 vols. 4to. But its noble supplement, in 6 vols. 4to., is certainly its 'better half.'

Having thus redeemed our pledge of furnishing a sketch of the history of our principal Encyclopædias, we may, perhaps, without any illiberality advert to the singular inconsistencies and contradictions with regard to the facts and experiments of science, which seem to constitute the great objection to any very extended work of this kind. Were we to attempt to point these out in the works of our predecessors, it would be without the slightest disrespect for their labors: they are assignable, for the far greater part, to that very progress of science to which such works contribute largely. But, during the publication of one of them, the whole science of chemistry, for instance, became revolutionised: and the old system was entitled, at the end of the work, to no more consideration in a schedule of science, than were the evanescent republics and kingdoms of Napoleon's erection, to a place on the map of Europe. While the very excellence and incomparably superior execution of the supplemental wing to the other extended work of this description, throws the whole of the elder part of the edifice into shade.

ENCY'STED, *adj.* Κύστις, a bag. Enclosed in a vesicle or bag.

*Encysted* tumours borrow their names from a cyst or bag in which they are contained. *Sharp's Surgery.*

END, *v. a., v. n.* & *n. s.*
END'ER, *n. s.*
END'ING,
END'LESS, *adj.*
END'LESSLY, *adv.*
END'LESSNESS,
END'LONG, *adv.*
END'MOST, *adj.*
END'WISE, *adv.*

Sax. enð; Belg. & Teut. *ende*; Goth. *ende*; Swed. *ænda*; Hindoo *anta*; Ang.-Sax. endian is to make an end. To terminate; conclude; finish; destroy: as a neuter verb, to conclude; to arrive at the utmost point of time or space; to cease; to die: as a substantive, it means the point where a course of action or pursuit terminates, or to which it is directed; the extreme point of time, space, or length: hence, cessation; limit; ultimate state or doom; death. End-day is used by our oldest writers for the last day, and the day of death: thus also our authorised version of the Bible uses the word end. See the instance quoted. An-end means on an end: in Norfolk we have heard an early stirring housewife described as 'up-an-end betimes,' or early on her feet, i. e. busy, and not a-bed; and thus we may understand Shakspeare; 'slave, still an-end,' still here, about me. Endlong, is lengthways; in a straight direction. Endmost, at the farthest, or remotest end: endwise, erectly; on an end.

The seruaunt dwellith not in the hous withouten *eende*, but the sone dwellith withouten *eende*.
*Wiclif. Jon.* 8.

Bi paience renne we to the bateil purposid to us, biholdynge in to the maker of feith and the parfayt *endere* Iesu. *Id. Ebrewis* 11.

And God said unto Noah, the *end* of all flesh is come before me. *Bible, Gen.* vi. 13.

Jacob had made an *end* of commanding his sons. *Genesis.*

They have *ended* all my harvest. *Ruth.*

Mark the perfect man, and behold the upright, for the *end* of that man is peace. *Psalms.*

The *end* of the commandment is charity. 1 *Tim.*

———— at his *ende-day* he was buried there. *R. Gloucester.*

But after labours long, and sad delay,
Brings them to joyous rest, and *endless* bliss. *Spenser.*

Wisdom may have framed one and the same thing to serve commodiously for divers *ends*, and of those *ends* any one may be sufficient cause for continuance, though the rest have ceased. *Hooker.*

None of the heathens, how curious soever in searching out all kinds of outward ceremonies, could ever once endeavour to resemble herein the church's care for the *endless* good of her children. *Id.*

He would in one battle *end* the quarrel with them, either win or lose the empire. *Knolles.*

O, that a man might know
The *end* of this day's business ere it come!
But it sufficeth that the day will *end*. *Shakspeare.*

My guilt be on my head, and ther's an *end*! *Id.*

All the priests and friars in my realm,
Shall in procession sing her *endless* praise. *Id.*

Stayest thou to vex me here?
Slave, that, still *an end*, turns me to shame! *Id.*

Thus I clothe my naked villainy
With old odd *ends*, stolen forth of Holy Writ,
And seem a saint. *Id. Richard III.*

The lord of Stafford dear to-day had bought
Thy likeness; for instead of thee, King Harry,
This sword hath *ended* him. *Id. Henry IV.*

Except thou desire to hasten thine *end*, take this for a general rule, that thou never add any artificial heat to thy body by wine or spice, until thou find that time hath decayed thy natural heat. *Raleigh.*

In dealing with cunning persons, we must ever consider their *ends* to interpret their speeches; and it is good to say little to them, and that which they least look for. *Bacon.*

Her only *end* is never-ending bliss;
Which is, the eternal face of God to see,
Who last of *ends*, and first of causes is;
And to do this, she must eternal be. *Davies.*

If the world's age and death be argued well
By the sun's fall, which now tow'rds earth doth bend,
Then we might fear, that virtue, since she fell
So low as woman, should be near her *end*. *Donne.*

The tropick circles have,
Yea, and those small ones, which the poles engrave,
All the same roundness, evenness and all
The *endlessness* of the Equinoctial. *Id.*

Only let our merchants take heed, lest they go so far, that they leave God behind them;—lest they *end* their prosperous adventures, in the shipwreck of a good conscience. *Bp. Hall.*

Yet happy were my death, mine *ending* blest,
If this I could obtain, that breast to breast,
Thy bosom might receive my yielded spright. *Fairfax.*

There was a purpose to reduce the monarchy to a republick, which was far from the *end* and purpose of that nation. *Clarendon.*

Hear and mark
To what *end* I have brought thee hither. *Milton.*

The angel *ended*, and in Adam's ear,
So charming left his voice. *Milton.*

All our glory extinct, and happy state,
Here swallowed up in *endless* misery! *Id.*

Yet vainly most their age in study spend;
No *end* of writing books, and to no *end*. *Denham.*

As it is pleasant to the eye to have an *endless* prospect, so it is some pleasure to a finite understanding to view unlimited excellencies. *Tillotson.*

Then ease your weary Trojans will attend,
And the long labours of your voyage *end*. *Dryden.*

Heaven, as its instrument, my courage sends;
Heaven ne'er sent those who fight for private *ends*. *Id.*

Then spurring at full speed, ran *endlong* on,
Where Theseus sat on his imperial throne. *Id.*

The supreme power cannot take from any part of his property without his own consent: for the preservation of property being the *end* of government, and that for which men enter into society, it necessarily supposes and requires, that the people should have property, without which they must be supposed to lose that, by entering into society, which was the *end* for which they entered into it. *Locke.*

There would be an *end* of all civil government, if the assignment of civil power were by such institution. *Id.*

His sovereignty, built upon either of these titles, could not have descended to his heir, but must have *ended* with him. *Id.*

My God, my father, and my friend,
Do not forsake me in my *end*. *Roscommon.*

Others are apt to attribute them to some false *end* or intention. *Addison's Spectator.*

I mark the various fury of the winds:
These neither seasons guide, nor order binds:
They now dilate and now contract their force;
Various their speed, but *endless* is their course. *Prior.*

Though God's promise has made a sure entail of grace to all those who humbly seek, yet it no where engages that it shall importunately and *endlessly* renew its assaults on those who have often repulsed it. *Decay of Piety.*

For when success a lover's toil attends,
Few ask if fraud or force attained his *ends*. *Pope.*

Each pleasing Blount shall *endless* smiles bestow,
And soft Belinda's blush for ever glow. *Id.*

The causes and designs of an action are the beginning: the effects of these causes, and the difficulties met with in the execution of these designs are the middle; and the unravelling and resolution of these difficulties, are the *end*. *Broome of Epic Poetry.*

Speakers, whose chief business is to amuse or delight, do not confine themselves to any natural order, but, in a cryptical or hidden method, adapt every thing to their *ends*. *Watts.*

It is required that they should first study and understand the lessons, before they are put upon reading them properly: to which *end* each boy should have an English dictionary to help him over difficulties. *Franklin.*

But now being lifted into high society,
And having picked up several odds and *ends*
Of free thoughts in his travels for variety,
He deemed, being in a lone isle, amongst friends. *Byron.*

ENDAM'AGE, *v. a.* } Fr. *endomm.ger*:
ENDAM'AGEMENT, *n. s.* } from en and damage. To mischief; injure; prejudice

Nor ought he cared whom he *endamaged*
By tortuous wrong, or whom bereaved of right. *Spenser.*

It cometh sometime to pass, that a thing unnecessary in itself doth notwithstanding appear convenient to be still held, even without use, lest by reason of that coherence which it hath with somewhat most necessary, the removal of the one should *endamage* the other. *Hooker.*

Where your good word cannot advantage him,
Your slander never can *endamage* him. *Shakspeare.*

These flags of France that are advanced here,
Have hither marched to the *endamagement*. *Id.*

The trial hath *endamaged* thee no way;
Rather more honour left, and more esteem. *Milton.*

The being rightfully possessed of great power and riches, exceedingly beyond the greatest part of the sons of Adam, is so far from being an excuse, much less a reason, for rapine and oppression, which the *endamaging* another without authority is, that it is a great aggravation of it: for the exceeding the bounds of authority is no more a right in a great, than in a petty officer. *Locke.*

When an erroneous opinion is published, the publick is *endamaged*, and therefore it becomes punishable by the magistrate. *South.*

A great alteration doth seldom any wise *endamage* or disorder the globe. *Woodward. Nat. Hist.*

ENDAN'GER, *v. a.* } From en and danger.
ENDA'NGERMENT, *n. s.* } To put to hazard or peril: a state of hazard.

He—bade his servant Talus to invent
Which way he enter might without *endangerment*. *Spenser.*

He that turneth the humours back, and maketh the wound bleed inwards, *endangereth* malign ulcers. *Bacon.*

He finds it best for his people to exercise their faith that the serpents may bite, and their bitings may envenom, and that this venom may *endanger* the Israelites. *Bp. Hall. Contemplations.*

Every one desires his own preservation and happiness, and therefore hath a natural dread of every thing that can destroy his being, or *endanger* his happiness. *Tillotson.*

My kingdom claims your birth; my late defence,
Of our *endangered* fleet, may claim your confidence. *Dryden.*

Volatile salts never exist in an animal body; the heat required to make them volatile, *endangers* the animal. *Arbuthnot.*

The interest *endangered* is our title to heaven. *Rogers.*

ENDEAR', *v. a.* } From en and DEAR,
ENDEAR'MENT, *n. s.* } which see. To make dear or beloved; also to make dear in the sense of costly, high in price: endearment occurs chiefly in the former sense.

All those instances of charity which usually *endear* each other, sweetness of conversation, frequent admonition, all significations of love, must be expressed towards children. *Taylor.*

And in the mixture of all these appears
Variety, which all the rest *endears*. *Denham.*

Is not the separate property of a thing the great cause of its *endearment* amongst all mankind? *South.*

The only thing that can *endear* religion to your practice, will be to raise your affections above this world. *Wake.*

Her first *endearments*, twining round the soul. *Thomson.*

Such are the vicissitudes of the world, through all its parts, that day and night, labour and rest, hurry and retirement, *endear* each other. *Johnson.*

Those bodies, which, when full of life and beauty, lay in their arms, and were their joy and comfort, when dead and putrid, become but the more loathsome from remembrance of former *endearments.* *Burke.*

And these were not of the vain kind which cloys,
For theirs were buoyant spirits, never bound
By the mere senses, and that which destroys
Most love; possession, unto them appeared
A thing which each *endearment* more *endeared.*
*Byron.*

ENDEAV'OUR, *v. a., v. n.* & *n. s.* } Old. Fr. ENDEAV'OURER, } *indevoir,* from *devoir* or *debuoir,* duty; from Lat. *debeo, debitus,* to owe. To attempt; strive; labor to a particular purpose or end, taking *after* before the object: as a substantive, endeavour signifies effort, attempt, whether to attain or avoid.

Heaven doth divide
The state of man in divers functions,
Setting *endeavour* in continual motion.
*Shakspeare.*

How many *endeavour* that, not without danger of curses and uproar, which was voluntarily tendered unto Moses. *Bp. Hall. Contemplations.*

They take very unprofitable pains who *endeavour* to persuade men that they are obliged wholly to despise this world and all that is in it, even whilst they themselves live here. *Clarendon.*

To prayer, repentance, and obedience due,
Though but *endeavoured* with sincere intent,
Mine ear shall not be slow, mine ear not shut.
*Milton.*

Such an assurance as will quicken men's *endeavours* for the obtaining of a lesser good, ought to animate men more powerfully in the pursuit of that which is infinitely greater. *Tillotson.*

The bold and sufficient pursue their game with more passion, *endeavour,* and application, and therefore often succeed. *Temple.*

He appears an humble *endeavourer,* and speaks honestly to no purpose. *Rymer's Tragedies.*

I take imitation of an author to be an *endeavour* of a later poet to write like one who has written before him on the same subject. *Dryden.*

This is the hinge on which turns the liberty of intellectual beings, in their constant *endeavours* after, and steady prosecution of, true felicity. *Locke.*

For the reason of this wonder, he attempts it by mechanism, and *endeavours* to make it out by atomical aporrheas, which, passing from the cruentate cloth or weapon to the wound, and being incorporated with the particles of the salve, carry them in their embraces to the affected part. *Glanville.*

She could not make the least *endeavour* towards the producing of any thing that hath vital and organical parts. *Ray.*

About three hundred persons were condemned to the galleys, and treated most cruelly in them, upon no other pretence, but because they would not change their religion, and had *endeavoured* to make their escape out of France. *Burnet.*

I could wish that more of our country clergy would *endeavour after* a handsome elocution. *Addison.*

Of old, those met rewards who could excel;
And those were praised, who but *endeavoured* well.
*Pope.*

To *endeavour* to work upon the vulgar with fine sense, is like attempting to hew blocks with a razor. *Id.*

In order to a full acquaintance with ourselves, we must *endeavour* to know not only what we are, but what we shall be. *Mason.*

To be idle and to be poor have always been reproaches, and therefore every man *endeavours* with his utmost care to hide his poverty from others, and his idleness from himself. *Johnson.*

ENDEAVOUR RIVER, a river on the north-east coast of New Holland, with a bar at its mouth, and not having depth of water for vessels to sail more than a mile above the bar. At low water there is not above nine or ten feet water on the bar, and not more than seventeen or eighteen at high tide. The soil in the neighbourhood is not considered productive, but turtles are met with here in abundance.

ENDEAVOUR STRAIT, a narrow sea or channel between New Guinea and New Holland, about ten leagues in length and five broad, except at the north-east entrance, where it is contracted by Prince of Wales's Islands. It is about thirty miles long by fifteen wide, but contracts to not more than a mile in width at the east entrance. It was navigated by Torres as early as 1606.

ENDE'MIAL, *adj.* } Fr. *endemique;* Gr. ENDEM'IC, } ενδημιος, from εν and ENDEM'ICAL. } δημος, the people. Peculiar to a country or common among a people.

We may bring a consumption under the notion of a pandemick, or *endemick,* or rather a vernacular disease, to England. *Harvey.*

Solenander, from the frequency of the plants springing up in any region, could gather what *endemial* diseases the inhabitants were subject to. *Ray.*

What demonstrates the plague to be *endemial* to Egypt, is its invasion and going off at certain seasons. *Arbuthnot.*

ENDE'NIZE, *v. a.* From denizen. To make free; to enfranchise.

The English tongue hath been beautified and enriched out of other tongues, by enfranchising and *endenizing* strange words. *Camden.*

ENDIAN, a town in the province of Kuzistan, Persia, occupying both banks of the river Tab, which is here 240 feet broad. It is surrounded by walls which are nowhere above three feet thick; and is about two miles in circuit. Its trade is with Bassora and Bebahan. Population 4000 or 5000.

ENDINGEN a town of Baden, situated near the Rhone, seven miles north-west of Friburgh; having about 2700 inhabitants.

E'NDIVE, *n. s.* Fr. *endive;* Lat. *intybum.* A plant.

*Endive,* or succory, is of several sorts; as the white, the green, and the curled. *Mortimer.*

ENDORSE', *v. a.* } Fr. *endosser,* from Lat. ENDORSE'MENT, *n. s.* } *in* and *dorsum,* the back. ENDOSS', *v. a.* } To place on the back, by writing or otherwise. See the extract from Milton. Chiefly applied in modern times commercially, or to writing on the back of a negotiable instrument or bill of exchange.

——— A shield, in which he did *endoss*
His dear Redeemer's badge. *Spenser.*

A French gentleman speaking with an English of the law salique, the English said that was meant of the women themselves, not of males claiming by women. The French gentleman said, Where do you

and that gloss? The English answered, Look on the backside of the record of the law salique, and there you shall find it *endorsed*. *Bacon's Apophthegm.*

The' *endorsement* of supreme delight,
Writ by a friend, and with his blood.
*Herbert.*

Chariots, or elephants *endorsed* with towers
Of archers. *Milton's Paradise Regained.*

Upon credential letters was *endorsed* this superscription, To the king who hath the sun for his helmet. *Howel.*

All the letters I can find of yours I have fastened in a folio cover, and the rest in bundles *endorsed*. *Swift to Pope.*

ENDOW', *v. a.* } Fr. *douar;* Span. and
ENDUE' *v. a.* } Port. *dotar;* Lat. *indotare,*
ENDOW'MENT, *n. s.* } to give a portion to a daughter, &c., from *dos, dotis,* a portion. Skinner says that endue is a corrupt method of writing endow. To enrich with a portion or with excellence of any kind. An endowment is a property, revenue, or gifts bestowed or appropriated.

Leah said, God hath *endued* me with a good dowry. *Genesis.*

He shall surely *endow* her to be his wife. *Exodus.*

*Endue* them with thy holy spirit. *Common Prayer.*

Wisdom was Adam's instructor in Paradise: wisdom *endued* the fathers, who lived before the law, with the knowledge of holy things. *Hooker.*

These banished men that I have kept withal,
Are men *endued* with worthy qualities. *Shakspeare.*

I do not think
So fair an outward, and such stuff within,
*Endows* a man but him. *Id. Cymbeline.*

Who fights
With passions, and o'ercomes them, is *endued*
With the best virtue, passive fortitude.
*Massinger.*

I at first with two fair gifts
Created him *endowed*; with happiness
And immortality; that fondly lost,
This other served but to eternize woe.
*Milton.*

With what ease,
*Endued* with royal virtues as thou art,
Might'st thou expel this monster from his throne?
*Id.*

Whatsoever other knowledge a man may be *endowed* withal, he is but an ignorant person who doth not know God, the author of his being. *Tillotson.*

Every Christian is *endued* with a power, whereby he is enabled to resist and conquer temptations. *Id.*

A chapel will I build, with large *endowment*. *Dryden.*

An alms-house I intend to *endow* very handsomely for a dozen superannuated husbandmen. *Addison.*

Among those who are the most richly *endowed* by nature, and accomplished by their own industry, how few are there whose virtues are not obscured? *Id.*

God did never command us to believe, nor his ministers to preach, any doctrine contrary to the reason he hath pleased to *endow* us with. *Swift.*

Our souls therefore must be of a more excellent nature than theirs; and from the power of thought with which they are *endowed*. *Mason.*

Stephen Potts, a young rustic, just broke from school, and of rustic education, with *endowments* rather above the common order. *Franklin.*

Where will you find a race like theirs, *endowed*
With all that man e'er wished, or Heaven bestowed?
*Cowper.*

*Endued* with reason only to descry
His crimes and follies with an aching eye;
With passions, just that he may prove, with pain,
The force he spends against their fury vain. *Id.*

ENDRACHT'S LAND, or Concord, a large but low and sterile tract of the west coast of New Holland, in which is a spacious bay, which the French have called after the celebrated English navigator Dampier: he had previously given it the appellation of Shark's Bay.

ENDRIE, a town in the district of Eastern Caucasus, Asiatic Russia, situated on the river Akatsch, about twenty miles from the Caspian Sea. It consists of nearly 3000 houses, and is the common property of several Tartar princes, who acknowledge the authority of the Russians. Here are several mosques, an Armenian church, and two Jewish synagogues. The Jews are very enterprising in commerce; and a great trade is carried on in slaves and plunder, as all persons and their property kidnapped by the neighbouring tribes are sold or redeemed here. Endrie is acknowledged a free town by all the nations of Caucasus. It was formerly called Baal or Balek, but having been defended against the Arabs, by a governor called Endrie, became known by his name. It was burnt by the Russians in 1722.

ENDURE', *v. n.* & *v. a.* } Fr. *endurer,* from
ENDU'RANCE, *n. s.* } Lat. *durare;* Heb.
ENDU'RER. } דור, to inure to hardship. To bear or brook evil; to last; remain: as an active verb, undergo; sustain; bear patiently; support: endurance is, continuance in grief; patience; or continuance generally.

For how can I *endure* to see the evil that shall come unto my people? Or how can I *endure* to see the destruction of my kindred? *Esther* viii. 6.

Doth the crown *endure* to every generation? *Proverbs.*

Labour not for the meat which perisheth, but for that meat which *endureth* unto everlasting life. *John.*

And therewithal the king no longer *enduring* to sitte vp, laide him down on his right side, his face towarde them: and none was there present that coulde refrain from weeping. *Sir T. More.*

Some of them are of very great antiquity and continuance, others more late and of less *endurance*. *Spenser's Ireland.*

They are very valiant and hardy; for the most part great *endurers* of cold, labor, hunger, and all hardiness. *Spenser.*

Taking into the city all such things as they thought needful for the *enduring* of the siege, they destroyed all the rest. *Knolles's History.*

By thine own tongue thou art condemned, and must
*Endure* our law. *Shakspeare. Cymbeline.*

I should have ta'en some pains to bring together
Yourself and your accusers, and have heard you,
Without *endurance* further. *Id. Henry VIII.*

The hardness of bodies is caused chiefly by the jejuneness of the spirits, and their imparity with the tangible parts, which make them not only hard, but fragile, and less *enduring* of pressure. *Bacon.*

Our great English lords could not *endure* that any kings should reign in Ireland but themselves; nay, they could hardly *endure* that the crown of England should have any power over them. *Davies*

When a heart is hardened with any passion, it will *endure* much, ere it will yield to relent.
*Bp. Hall. Contemplations.*

So dear I love him, that with him all deaths
I could *endure*; without him, live no life. *Milton.*

Great things of small
One can create; and in what place soe'er
Thrive under evil, and work ease out of pain,
Through labour and *endurance*. *Id.*

The deer *endureth* the womb but eight months, and is complete at six years. *Browne's Vulgar Errours.*

I wish to die, yet dare not death *endure*.
*Dryden.*

The gout haunts usually the easy and the rich, the nice and the lazy, who grow to *endure* much, because they can *endure* little. *Temple.*

Their fortitude was most admirable in their presence and *endurance* of all evils, of pain, and of death.
*Id.*

By being able to repeat measures of time, or ideas of stated length of duration in our minds, we can imagine duration, where nothing does really *endure* or exist. *Locke.*

I would fain know whether that man takes a rational course to preserve himself, who refuses the *endurance* of these higher troubles, to secure himself from a condition infinitely more miserable? *South.*

But I who ne'er was blessed by Fortune's hand,
Nor brightened ploughshares in paternal land;
Long in the noisy town have been immured,
Respired its smoke, and all its cares endured. *Gay.*

The love of praise, howe'er concealed by art,
Reigns more or less, and glows in every heart;
The proud to gain it toils, and toils *endure*,
The modest shun it, but to make it sure. *Young.*

When disappointment snaps the clue of hope,
And through disastrous night they darkling grope,
With deaf *endurance* sluggishly they bear,
And just conclude that 'fools are fortune's care.'
*Burns.*

The *enduring* record bears the artist's name,
Demands his honors, and asserts his fame.
*Sheridan.*

Thou chief star!
Centre of many stars! which makest our earth
*Endurable*, and temperest the hues
And hearts of all who walk within thy rays!
*Byron.*

ENDYMION, in fabulous history, a shepherd son of Æthlius and Calyce. It is said that he required of Jupiter to grant to him to be always young, and to sleep as much as he would; whence came the proverb of Endymionis somnum dormire, to express a long sleep. Diana saw him naked as he slept on Mount Latmos; and was so struck with his beauty, that she came down from heaven every night to enjoy his company. Endymion married Chromia daughter of Itonus: by whom he had three sons, Pæon, Epeus, and Æolus, and a daughter called Eurydice. The fable of Endymion's amours with Diana, or the moon, arose from his knowledge of astronomy; for as he passed the night on some high mountain, to observe the heavenly bodies, it came to be reported that he was courted by the moon. Some suppose that there were two of that name; the son of a king of Elis, and the shepherd or astronomer of Caria. The people of Heraclea maintained that Endymion died on Mount Latmos, and the Eleans pretended to show his tomb at Olympia in Peloponnesus.

E'NECATE, *v. a.* Lat. *eneco.* To kill; to destroy.

Some plagues partake of such a pernicious degree of malignity, that, in the manner of a most presentaneous poison, they *enecate* in two or three hours, suddenly corrupting or extinguishing the vital spirits.
*Harvey on the Plague.*

ENEMA; Gr. ενιημι, to inject; a clyster. A well known form of conveying both nourishment and medicine to the system, by injection through the anus, under certain morbid circumstances, such as occur in lock-jaw, diseased œsophagus, &c. By these means the body can be supported for a few weeks, while an attempt is made at effecting a cure. It is composed, in such cases, of animal broths, gruels made of farinaceous seeds, mucilages, &c. As a form of medicine, clysters are no less useful; and, according to the intention with which they are prescribed, they are either of an emollient, anodyne, or purgative nature.

EN'EMY, *n. s.* Fr. *ennemi;* Span. *enemigo,* Ital. *inimico;* Lat. *inimicus;* i. e. *in* privative, and *amicus*, a friend. A foe, public or private; one that is averse from, or dislikes: applied in a particular sense theologically, i. e. to Satan, the great enemy of God and man.

Netheless bryngе ye hidur tho myn *enemys* that wolden not that I regned on hem; and sle ye before me. *Wiclif. Luk* 19.

And at the laste deeth the *enemy* schal be distried, for he hath maad suget alle thingis undir hise feet.
*Id.* 1 *Cor.* 15.

I say unto you, love your *enemies*. *Matt.*
Defend us from the danger of the *enemy*.
*Common Prayer.*

Kent in disguise,
Followed his *enemy* king, and did him service
Improper for a slave. *Shakspeare. King Lear.*

All these statutes speak of English rebels and Irish *enemies*, as if the Irish had never been in condition of subjects, but always out of the protection of the law.
*Davies on Ireland.*

They were thine *enemies* that raised thee to the cross; how can they be other than thy friends, that are *enemies* to thy most cruel and indign crucifiction.
*Bp. Hall.*

'Tis now no time to dally,
The *enemy* begin to rally;
Let us that are unhurt and whole
Fall on, and happy man be's dole.
*Butler. Hudibras.*

Pride destroys all symmetry and grace, and affectation is a more terrible *enemy* to fine faces than the small-pox. *Hughes.*

A man's wisdom is his best friend; folly his worst *enemy*. *Sir W. Temple.*

By asserting the scripture to be the canon of our faith, I have unavoidably created to myself *enemies* in the papists directly, because they have kept the scripture from us what they could.
*Dryden. Pref. to Religio Laici.*

It stands here stigmatized by the apostle, as a temper of mind rendering men so detestably bad, that the great *enemy* of mankind neither can nor desires to make them worse. *South.*

The *enemy* thinks of raising threescore thousand men for the next summer. *Addison on the War.*

He that designedly uses ambiguities, ought to be looked on as an *enemy* to truth and knowledge.
*Locke.*

Bold is the critick, who dares prove
These heroes were no friends to love;
And bolder he who dares aver,
That they were *enemies* to war. *Prior.*

Now the first steps to this are seldom thought worth our care; sometimes not taken notice of; so that the *enemy* is frequently got close up to us, and even within our trenches, before we observe him. *Mason.*

The sights he was accustomed to behold,
The wild seas, and wild men with whom he cruised,
Had cost his *enemies* a long repentance,
And made him a good friend—but bad acquaintance.
*Byron. Don Juan.*

EN'ERGIZE, *v. a.*
ENERGET'IC, *adj.*
ENERGET'ICAL,
ENERGET'ICALLY, *adv.*
ENER'GIC, *adj.*
EN'ERGY, *n. s.*

Fr. *energie*; Ital. *energia*, *enargia*; Sp. and Port. *energia*; Gr. ενεργεια, of εργον, work. 'Effectual operation.'—Minsheu. 'Efficient faculty or act.'—Wilkins. To energize is to excite to forcible and effective action; energic and energetic, are powerful in effect.

They are not effective of any thing, nor leave no work behind them, but are *energies* merely; for their working upon mirrours, and places of echo, doth not alter any thing in those bodies. *Bacon.*

These miasms entering the body, are not so *energetick* as to venenate the entire mass of blood in an instant. *Harvey.*

God thinketh with operation infinitely perfect, with an omnipotent as well as an eternal *energy*. *Grew.*

Swift and ready, and familiar communication is made by speech; and, when animated by elocution, it acquires a greater life and *energy*, ravishing and captivating the hearers. *Holder.*

Whether with particles of heavenly fire
The God of nature did his soul inspire;
Or earth, but new divided from the sky,
And pliant still, retained the' ethereal *energy*.
*Dryden.*

Matter, though divided into the subtilest parts, moved swiftly, is senseless and stupid, and makes no approach to vital *energy*. *Ray.*

Who did ever, in French authors, see
The comprehensive English *energy*?
*Roscommon.*

Beg the blessed Jesus to give an *energy* to your imperfect prayers, by his most powerful intercession. *Smalridge.*

In all your lines let *energy* be found,
And learn to rise in sense, and sink in sound.
*Garth.*

How can concussion of atoms beget self-consciousness, and powers and *energies* that we feel in our minds? *Bentley.*

Many words deserve to be thrown out of our language, and not a few antiquated to be restored, on account of their *energy* and sound. *Swift*

What but God!
Inspiring God! who, boundless spirit all,
And unremitting *energy*, pervades,
Adjusts, sustains, and agitates the whole.
*Thomson.*

'Who would have supposed,' said he, 'Franklin to be capable of such a composition? What painting, what *energy*, what fire! he has surpassed the original.' *Franklin.*

They (the works of malice and injustice) are finished with a bold masterly hand; touched as they are with the spirit of those vehement passions that call forth all our *energies*. *Burke.*

Thy language at this distant moment shows
How much the country to the conqueror owes;
Expressive, *energetic*, and refined,
It sparkles with the gems he left behind. *Cowper.*

Rouse the dull ear, the hoodwinked eye unbind,
And give to *energy* the public mind. *Darwin.*

And now, expanded to the beams of truth,
New *energies* and charms unknown before
His mind discloses. *Beattie.*

Nought's more sublime than *energetic* bile,
Though horrible to see, yet grand to tell,
Like ocean warring 'gainst a rocky isle—
And the deep passions flashing through her form
Made her a beautiful embodied storm. *Byron.*

ENERGUMENS, in church history, persons supposed to be possessed by the devil, concerning whom there were many regulations among the primitive Christians. They were denied baptism and the eucharist, in some churches; but, though they were under the care of exorcists, they were allowed the public prayers of the church, and were permitted to be present. See EXORCISM.

ENERVE', *v. a.*
ENER'VATE, *v. a.* & *adj.*
ENERVA'TION, *n. s.*

Old Fr. *enerver*; Span. *enervar*; Lat. *enervo*, *enervare*. To weaken or break the force of; make powerless. Enervation is the act of weakening, or state of being weakened; effeminacy

Great empires, while they stand, do *enervate* and destroy the forces of the natives which they have subdued, resting upon their own protecting forces. *Bacon.*

We shall be able to solve and *enerve* their force. *Digby.*

Such object hath the power to soften and tame
Severest temper, smooth the ruggedest brow,
*Enerve*, and with voluptuous hope dissolve.
*Milton.*

If that sheepish softness, which often *enervates* those who are bred like fondlings at home, be carefully to be avoided, it is principally so for virtue's sake; for fear lest such a yielding temper should be too susceptible of vicious impressions, and expose the novice too easily to be corrupted. *Locke.*

On each *enervate* string they taught the note,
To pant, or tremble through an eunuch's throat.
*Pope.*

Footmen exercise themselves, whilst their *enervated* lords are softly lolling in their chariots.
*Arbuthnot and Pope.*

Fancy *enervates*, while it sooths, the heart,
And, while it dazzles, wounds the mental sight:
To joy, each heightening charm it can impart,
But wraps the hour of woe in tenfold night.
*Beattie.*

ENERVATION is the act of destroying the force, use, or office, of the nerves, either by cutting them, or weakening them with debauchery. Excess of wine, and other strong, hot, spirituous liquors, enervates, or weakens the nerves. Too great abstinence has the same effect. A moderate use of these and other stimuli strengthens them.

ENESEI, or YENESEI, a town and river of Siberia. The latter rises in the borders of Chinese Tartary, and, taking a northern course, runs into the Frozen Ocean. The town of this name is in

the government of Tobolsk, and seated on the river. It is fortified, of considerable size, and populous; having a jurisdiction over an extensive tract, which yields a tribute of furs to the government.

ENFEE'BLE, *v. a.* En, expletive, and FEEBLE, which see. To weaken; deprive of power or strength.

> My people are with sickness much *enfeebled*.
> *Shakspeare.*

> I've belied a lady,
> The princess of this country; and the air on't
> Revengingly *enfeebles* me. *Id. Cymbeline.*

> Some employ their time in affairs below the dignity of their persons; and being called by God, or the republick, to bear great burdens, do *enfeeble* their understandings by sordid and brutish business.
> *Taylor's Rule of Holy Living.*

> Much hath hell debased, and pain
> *Enfeebled* me, to what I was in heaven!
> *Milton.*

> Sure, nature formed me of her softest mould,
> *Enfeebled* all my soul with tender passions,
> And sunk me even below my own weak sex.
> *Addison.*

> Abandoned all to soft Enone's charms,
> He to oblivion doomed the listless day;
> Inglorious lulled in Love's dissolving arms
> While flutes lascivious breathed the' *enfe[illegible]ing* lay.
> *[illegible]eattie.*

ENFE'OFF, *v. a.* } Low Lat. *f[illegible]amen-*
ENFE'OFFMENT, *n. s.* } *tum.* To inv[illegible] with any dignities or possessions; a law term

> If the eldest son *enfeoff* the second, reserving homage, and that homage paid, and then the second son dies without issue, it will descend to the eldest as heir, and the seigniory is extinct. *Hale.*

ENFE'OFFMENT, *n. s.* From enfeoff. The act of enfeoffing; the instrument or deed by which one is invested with possessions.

ENFETTER, *v. a.* From fetter. To bind in fetters; to enchain. Not in use.

> His soul is so *enfettered* to her love,
> That she may make, unmake, do what she list.
> *Shakspeare.*

ENFIELD (William), LL.D., an elegant and admired miscellaneous writer, born at Sudbury in 1741. He was early destined for the ministry, and received his education at the academy of Dr. Ashworth, a protestant dissenter at Daventry. When about twenty-two years of age he was chosen minister by the congregation at Benn's Garden, Liverpool; and soon gained considerable reputation. During his residence at Liverpool he published two volumes of sermons, and a collection of hymns and family prayers, which met with a favorable reception. He removed to Warrington about 1770, having been appointed tutor and lecturer in the belles lettres at Warrington academy; a station which he filled for several years with unremitted assiduity. Among many useful books which he compiled, the Speaker, composed of pieces of recitation from the best and most approved authors, has gained him considerable celebrity. He also published—The Preacher's Directory; The English Preacher, a collection of sermons from the most celebrated authors, in 9 vols. 12mo.; Biographical Sermons on the principal characters in the Old and New Testament; and a number of single sermons on particular occasions. His attention having been engaged by the controversy relative to literary property, he also wrote a pamphlet on that subject. He likewise published a history of Liverpool. Besides the above works, he published, during his residence at Warrington, Institutes of Natural Philosophy, theoretical and experimental, in 1 vol. 4to.; and about this time the university of Edinburgh conferred on him the degree of LL. D. After the dissolution of the academy at Warrington, in 1783, Dr. Enfield continued two years in that town in the capacity of a private tutor; but in 1785 he was chosen pastor of the Octagon meeting-house at Norwich. Not long after this, he gave up the labors of private tuition and devoted himself entirely to literary pursuits, and the duties attendant on his pastoral charge. He undertook and executed the laborious task of abridging Brucker's History of Philosophy, which he published in 2 vols. 4to. in 1791; and it has been admitted that the tenets of the different sects of philosophers were never exhibited with greater perspicuity and elegance. To the Biographical Dictionary, published under the inspection of Dr. Aikin and others, our author was an extensive contributor. He died on the 3rd of November, 1797, in the fifty-seventh year of his age.

ENFIELD, a township of New Hampshire, in Grafton county, eleven miles south-east of Dartmouth College. It had 724 citizens in 1790, chiefly farmers.

ENFILA'DE, *v. a.* & *n. s.* Fr. *enfilade, enfiler;* en and filer (Lat. *filum*). To draw out in file or threads; to extend lengthways; hence to sweep along a straight line with musquetry or artillery; a military term.

> The avenues, being cut through the wood in right lines, were *enfiladed* by the Spanish cannon.
> *Expedition to Carthagena.*

> In conducting the approaches at a siege care must be taken that the trenches be not *enfiladed* from any work of the place. To *enfilade*, is to sweep the whole length of any work, or line of troops, with the shot of artillery or small arms. *James.*

ENFILADE, in the art of war, is used in speaking of trenches, or other places which may be scoured by the enemy's shot along their whole length. In conducting the approaches at a siege care must be taken that the trenches be not enfiladed from any work of the place.

ENFINE, formerly Antinoe, a city of Egypt, built by Adrian in honor of his infamous favorite Antinous. It is situated towards the middle of Upper Egypt, and still contains several stately monuments of antiquity. This city was anciently very magnificent. It was about half a league in circumference, having two principal streets forty-five feet wide, intersecting each other at right angles, and running through its whole length. The others were more narrow, but equally straight; the two largest having gates at each end, part of which still remain. According to the Nubian geographer it was called the City of the Magi, because Pharaoh is said to have caused the Magicians to come thence to his court. Near it were the ruins of Abydos, where there was an

oracle of the god Besa, one of the most ancient in Egypt, and which was still famous in the time of Constantius. The ruins of the gates are the most beautiful pieces of architecture to be met with in this place. The handsomest has three vaulted entries; the middle one being forty feet high, twenty-two wide, and twenty thick; the other two smaller. Each of the façades of this edifice is ornamented with four pilasters in bas relief, with Corinthian capitals, the acanthus leaves of which have a considerable projection. It was surrounded by eight Corinthian columns, of which only one now remains, but the pedestals of the rest are still entire. Besides these, there are heaps of rubbish in different parts of the town, apparently the remains of ancient temples or palaces. All these seem to have been bordered by a colonnade, forming a portico on each side, where the inhabitants might walk secure from the heat of the sun. One of the squares was ornamented with four large Corinthian pillars, three of which are destroyed all but the bases. The fourth is quite entire, about fifty feet high, and the shaft composed of several stones. The pedestal has a Greek inscription, much defaced, dedicating it to the emperor Alexander Severus, to whom the senate of ALEXANDRIA had already dedicated the famous column mentioned under that article. These four other columns were therefore probably raised in honor of that emperor after his victories over the Persians; for the foliage of the oak, with which the first stone of the shaft is decorated, was a sign of victory among the Romans. Towards the end of the fourth century the city was peopled by Christians; and Palladius assures us that there were at that place twelve convents of virgins, and several others inhabited by monks. In the environs there are still several Coptic monasteries possessed by monks equally miserable and ignorant. The Nubian geographer informs us, that the city was surrounded by a well cultivated country, abounding in fruits and harvests; but these have now given place to sands and barren deserts.

ENFI'RE, *v. a.* From fire. To fire; to set on fire; to kindle. Obsolete.

> So hard those heavenly beauties be *enfired,*
> As things divine least passions do impress.
> *Spenser.*

ENFORCE', *v. a., v. n. & n. s.* } En, expletive, and force. To strengthen, invigorate, instigate, provoke, urge, compel: as a verb neuter, to attempt by force; to approve; evince. The derivations follow these meanings.
ENFORC'EDLY, *adv.*
ENFORCE'MENT, *n. s.*
ENFOR'CER.

> Fear gave her wings, and rage *enforced* my flight
> Through woods and plains. *Faerie Queene.*

> The idle stroke, *enforcing* furious way,
> Missing the mark of his misaimed sight,
> Did fall to ground. *Id.*

Which laws in such case we must obey, unless there be reason shewed, which may necessarily *enforce* that the law of reason, or of God, doth enjoin the contrary. *Hooker.*

> For competence of life I will allow you,
> That lack of means *enforce* you not to evil.
> *Shakspeare.*

> Sker away as swift as stones
> *Enforced* from the old Assyrian slings. *Id.*

> In this point charge him home, that he affects
> Tyrannick power: If he evade us there,
> *Enforce* him with his envy to the people,
> And that the spoils got on the Antiates
> Were ne'er distributed. *Id. Coriolanus.*

> All revoke
> Your ignorant election; *enforce* his pride
> And his old hate to you. *Id.*

> If thou did'st put this sour cold habit on,
> To castigate thy pride, 'twere well, but thou
> Dost it *enforcedly:* thoud'st courtier be,
> Wert thou not beggar. *Id. Timon.*

> More than I have said,
> The leisure and *enforcement* of the time
> Forbids to dwell on. *Id. Richard III.*

He that contendeth against these *enforcements,* may easily master or resist them. *Raleigh's History.*

A just disdain conceived by that queen, that so wicked a rebel should prevail against her, did move and almost *enforce* her to send over that mighty army. *Davies on Ireland.*

The personal descent of God himself, and his assumption of our flesh to his divinity, was an *enforcement* beyond all the methods of wisdom that were ever made use of in the world. *Hammond.*

When a man tumbles a cylinder or roller down an hill, 'tis certain that the man is the violent *enforcer* of the first motion of it. *Id.*

He prevailed with him, by *enforcing* the ill consequence of his refusal to take the office, which would be interpreted to his dislike of the court. *Clarendon.*

> He now defies thee thrice to single fight,
> As a petty enterprise of small *enforce.* *Milton.*

The rewards and punishments of another life, which the Almighty has established as the *enforcements* of his law, are of weight enough to determine the choice. *Locke.*

To avoid all appearance of disaffection, I have taken care to *enforce* loyalty by an invincible argument. *Swift.*

The most effectual grace is freely offered, to encourage and assist our obedience: advantages which no human laws have to *enforce* the observance of them. *Mason.*

ENFO'ULDRED, *adj.* From Fr. *foudre.* Mixed with lightning. Obsolete.

> Heart cannot think what courage and what cries,
> With foul *enfouldred* smoak and flashing fire,
> The hell-bred beast threw forth unto the skies.
> *Faerie Queene.*

ENFRAN'CHISE, *v. a.* } En and FRANCHISE, which see. To set free from slavery, custody, or the disadvantages of being an alien: to invest with the privileges of freedom.
ENFRAN'CHISEMENT, *n. s.*

> His mistress
> Did hold his eyes lockt in her crystal looks.
> -Belike, that now she hath *enfranchised* them,
> Upon some other pawn for fealty. *Shakspeare.*

> Never did captive with a freer heart
> Cast off his chains of bondage, and embrace
> His golden uncontrouled *enfranchisement.* *Id.*

Men, forbearing wine, come from drinking healths to a draught at a meal; and, lastly, to discontinue altogether; but if a man have the fortitude and resolution to *enfranchise* himself at once, that is the best. *Bacon's Essays.*

> But think that death hath now *enfranchised* thee,
> Thou hast thy expansion now and liberty. *Donne*

The English colonies, and some septs of the Irishry, *enfranchised* by special charters, were admitted to the benefit of the laws. *Davies.*

Romulus was the natura. parent of all those people that were the first inhabitants of Rome, or of those that were after incorporated and *enfranchised* into that name, city, or government. *Hale.*

If they won a battle, prisoners became slaves, and continued so in their generations, unless *enfranchised* by their masters. *Temple.*

He that is by charter made denizen of England, is said to be *enfranchised*; and so is he that is made a citizen of London, or other city, or burgess of any town corporate, because he is made partaker of those liberties that appertain to the corporation. *Cowel.*

These words have been *enfranchised* amongst us. *Watts.*

Cities gradually acquired wealth, a considerable share of the public taxes was levied on them, the inhabitants grew in estimation, and, being *enfranchised* by the sovereign, a place in parliament was the consequence of their liberty, and of their importance. *Robertson. History of Scotland.*

ENFRO'ZEN, *particip.* From frozen. Congealed with cold. Not used.

Yet to augment the anguish of my smart,
Thou hast *enfrozen* her disdainful breast.
That no one drop of pity there doth rest. *Spenser.*

ENGADINA, a territory of the Grisons among the Alps; extending along the banks of the river Inn, from its source to the Tirolese. It is divided into the Upper and Lower.

ENGADINA, LOWER, has a fertile soil and produces corn and fruits abundantly. It is subdivided into three communities. Cernetz is the chief town.

ENGADINA, UPPER, is a beautiful district, but on account of its elevation produces little else but rye and barley, the cold weather setting in early and ending late. Even in summer, the air is often very piercing and the corn much hurt by hoar frost. Hence the Italian proverb, 'Engadina terra fina, se non fosse la pruina;' i. e. 'Engadina would be a fine country were there no frost.' It is subdivided into two communities. Zuts is the capital.

ENGAGE', *v.a.* & *v.n.* } Fr. *engager*; Ital.
ENGAGE'MENT', *n. s.* } *ingaggiare.* En and gage. See GAGE. To bind, or be bound, to fulfil or accomplish certain engagements. Hence to make liable to a debt; pledge or hazard life in a service; unite, attach, employ, induce, or persuade; as well as to encounter, fight: and, as a neuter verb, to conflict; embark or enlist in any affair. Engagement has a similar diversity of application.

I have *engaged* myself to a dear friend,
*Engaged* my friend to his mere enemy.
To feed my means.
*Shakspeare. Merchant of Venice.*

The commemorating the death of Christ, is the professing ourselves the disciples of the crucified Saviour; and that *engageth* us to take up his cross and follow him. *Hammond.*

This is the greatest *engagement* not to forfeit an opportunity. *Id.*

Before I *engage* myself in giving any answer to this objection of inconsumptible lights, I would see the effect certainly averred *Digby.*

Upon advertisement of the Scots army, the ear. of Holland was sent with a body to meet and *engage* with it. *Clarendon.*

To every duty he could minds *engage*,
Provoke their courage, and command their rage. *Waller.*

Our army, led by valiant Torrismond,
Is now in hot *engagement* with the Moors. *Dryden.*

His beauty these, and those his blooming age,
The rest his house and his own fame *engage*. *Id.*
For I shall sing of battles, blood, and rage,
Which princes and their people did *engage*. *Id.*

'Tis not indeed my talent to *engage*
In lofty trifles, or to swell my page
With wind and noise. *Id. Persius.*

The merchant's wife, who abounds in plenty, is not to have downright money; but the mercenary part of her mind is *engaged* with a present of plate. *Spectator.*

Good-nature *engages* every body to him. *Addison.*

So shall I court thy dearest truth,
When beauty ceases to *engage*;
So thinking on thy charming youth,
I'll love it o'er again in age. *Prior.*

This practice may be obvious to any who impartially, and without *engagement*, is at the pains to examine. *Swift.*

Play, either by our too constant or too long *engagement* in it, becomes like an employment or profession. *Rogers.*

Encouraged by despair, or obstinate
To fall like men in arms, some dare renew
Feeble *engagement*, meeting glorious fate
On the firm land. *Philips.*

We have been firm to our allies, without declining any expence to which we had *engaged* ourselves, and we have even exceeded our *engagement*. *Atterbury.*

We have, in expence, exceeded our *engagements*. *Id.*

The rebel knave, who dares his prince *engage*,
Proves the just victim of his royal rage. *Pope.*

Or a certain sweetness of disposition, and agreeableness of manner, that is naturally *engaging*? *Mason.*

Sir Humphry, shooting in the dark,
Makes answer quite beside the mark:
No doubt, my dear, I bade him come,
*Engaged* myself to be at home,
And shall expect him at the door
Precisely when the clock strikes four. *Cowper.*
Yet hence, alas! insolvencies; and hence
The' unpitied victim of ill judged expence,
From all his wearisome *engagements* freed,
Shakes hands with business, and retires indeed. *Id.*

ENGANO ISLE, an island, about thirty miles in circumference, lying off the south-west coast of the Island of Sumatra, in lat. 5° 20′ S., long. 102° 20′ E. The male inhabitants go naked, and are fairer and taller than the Malays: their hair is black, which the men cut short, and the women wear long and turned up. They also wear a piece of plantain leaf round the waist Both men and women wear a ring of cocoa-nut, or leaves, in large holes at their ears. Their canoes are formed of planks sewed together and have out-rigging and sharp ends. They will hold six or seven men. They always carry lances made of hard wood and about seven feet long not only as weapons, but for the purpose of

striking fish. Some of these are tipped with pieces of bamboo made sharp, and the concave part filled with fish-bones and shark's teeth. Some are armed with pieces of bone made sharp and notched, and others pointed with bits of iron and copper. The soil of the island is for the most part a red clay, and the productions the same as on the coast of Sumatra. No rice has been seen among the inhabitants, nor have cattle or fowls of any kind been observed here. Their houses are circular, raised on posts, floored with planks, and about eight feet in diameter. The Malays are said formerly to have believed that the inhabitants of this island were all females. An expedition was fitted out in 1645 from Batavia, for the purpose of exploring this island; and it brought away sixty or seventy of the inhabitants, male and female. The former died soon after their arrival at Batavia, refusing to eat any other food than cocoa nuts; but the women were tractable and docile. In 1771 a vessel sent by the governor and council of Bencoolen, landed here; but owing to the petty thefts of the natives, and the imprudent conduct of the crew, hostilities soon arose between them which frustrated the purpose of the expedition. Large plantations of cocoa-nut trees were discovered on the shore with several spots of ground cleared for cultivation. Canoes came off to the ship, with cocoa-nuts, sugar-canes, toddy, and a species of yam.

ENGA'OL, *v. a.* From gaol. To imprison; to confine.

> Within my mouth you have *engaoled* my tongue,
> Doubly portcuilised with my teeth and lips.
> *Shakspeare.*

ENGA'RRISON, *v. a.* From garrison. To protect by a garrison.

> Neptune with a guard doth *engarrison* her strongly.
> *Howel.*

ENGASTRIMYTHI, in Pagan theology, the Pythians, or priestesses of Apollo, who delivered oracles from within, without any action of the mouth or lips. The ancient philosophers, &c., are divided upon the subject of the engastrimythi. Hippocrates mentions it as a disease; others will have it a kind of divination; others attribute it to the possession of an evil spirit; and others to art and mechanism. M. Scottus maintains, that the engastrimythi of the ancients were poets, who, when the priests could not speak, supplied the defect by explaining in verse what Apollo dictated in the cavity of the basin on the sacred tripod.

ENGEL (J. J.), a German philosopher, whose writings possess the happy art of treating the most abstruse subjects in a clear and popular manner. His Der Philosoph für die Welt, i. e. Philosopher for the World, and his Ideen zu einer Mimik, i. e. Ideas on Dramatic Art, are striking illustrations of this remark. He died in 1799. His works were published together in 12 vols. 8vo, at Leipsic, in 1801.

ENGEN, a town of Baden, once fortified and that has sustained several sieges. In the late revolutionary wars, it was occupied first by Moreau in 1796, at the period of his celebrated retreat; then in March, 1799, by general Jourdan; and again by Moreau in May, 1800, when he defeated the Austrians in this neighbourhood. It is not a large place, and has a population of only about 1000 inhabitants. Twenty two-miles west of Constance.

ENGEN'DER, *v. a.* & *v. n.* Fr. *engendrer*; en and gender. To procreate between two sexes; to produce from, cause, or bring forth: as a neuter verb, to be caused or produced.

> When that Aprilis with his shouris sote
> The drought of March had percid to the rote,
> And bathid every veyn in such licour,
> Of which vertue *engendrid* is the flour. *Chaucer.*

> Oh nature! thou, who of the self-same mettle,
> Whereof thy proud child, arrogant man, is pufft,
> *Engender'st* the black toad and adder blue.
> *Shakspeare.*

> The presence of a king *engenders* love
> Amongst his subjects and his loyal friends. *Id.*

> Say, can you fast? Your stomachs are too young,
> And abstinence *engenders* maladies. *Id.*

> Again, if souls do other souls beget;
> 'Tis by themselves, or by the body's power:
> If by themselves, what doth their working let,
> But they might souls *engender* every hour?
> *Davies.*

This bastard love is *engendered* betwixt lust and idleness. *Sidney.*

> Thick clouds are spread, and storms *engender* there.
> *Dryden.*

> Vice engenders shame, and folly broods o'er grief.
> *Prior.*

It unfolds the mind, *engenders* thoughts, and animates virtue. *Addison.*

Many vices, *engendered* or nourished by prosperity, delivered them (the Romans) over to the vilest race of tyrants that ever afflicted or disgraced human nature. *Robertson. Sermons.*

> If ever thou hast felt another's pain,
> If ever, when he sighed, hast sighed again,
> If ever on thy eyelid stood the tear,
> That pity had *engendered*, drop one here.
> *Cowper.*

> Yes, the hours
> Are silently *engendered* of that day
> When he, who built 'gainst Attila a bulwark,
> Shall yield, and bloodlessly and basely yield
> Unto a bastard Attila. *Byron.*

ENGHEIM, ENGHIEN, or ENGHUIN, a town of the Netherlands, in Hainault; famous for a battle fought near it, commonly called the battle of Steenkirk, between the British under king William III. and the French under marshal Luxemburgh; in which the latter were victorious; and general Mackay, the victor at Killicrankie in 1689, was killed. The great Condé also obtained a victory here; which was the origin of the ducal title which it gives to a prince of the house of Bourbon Condé. Here is a noble palace, park, and gardens. Enghien lies fifteen miles south-west of Brussels. Population about 3000.

ENGHIEN (Louis Antoine Henry, duke d'), was born in the year 1772. He was the son of the duke of Bourbon, and grandson of the prince de Condé, of whom Dr. Johnson remarked in his tour to Paris that he was a grandsire at thirty-nine; the fact was, however, still more extraordinary, for (as he was born in 1736) he was a grandfather at thirty-six. This young prince emigrated with his amiable and respectable father in 1789, after the capture of the Bastile, when he was hardly seventeen years of age;

and he served in the army of Condé with the most brilliant reputation, adored by his own soldiers, and respected for his courage, his courtesy, and his conduct, even by the republicans. This army exhibited the singular spectacle of three generations of heroes, fighting with equal courage and almost equal activity in the same field. After seven campaigns the treaty of Luneville put a period to its services.—It was disbanded, and, in 1801, when his father and grandfather came to England, the duke d'Enghien retired to the château of Ettenheim, a country residence situated close to the town of that name in Suabia.

An ardent and romantic passion for the princess Charlotte de Rohan-Rochefort, to whom it is supposed he was secretly married, induced the duke to reside at Ettenheim; where his only occupations were the sports of the field, the embellishment of his little domain, and the occasional society of her who shared and sweetened his exile. So domesticated was this young prince, and so attached to his retirement, that, till the fatal night in which he was dragged from it to assassination, he never quitted it but once, when he made an excursion to visit some of the beautiful scenes of Switzerland; but home was still more beautiful to him, and after a short tour he hastened back to Ettenheim.

For the following sketch of the sequel of this seizure, we are indebted to a spirited article in the Quarterly Review.

'On the night of the 15th of March, 1804, about 12,000 French troops, under the direction of Caulaincourt and the immediate command of generals Ordener and Fririon, crossed the Rhine in two or three divisions, and surrounded the town of Ettenheim and the residence of the prince. The duke had been apprised a day or two before that some design against him was on foot in France. He could not believe it; he was living, in a friendly country, a most peaceable and inoffensive life, under the security of his own innocence, and under the protection of the laws of nature and of nations: he could not believe it; and the assassins found that no kind of precaution had been taken against them.

'When the duke heard them surrounding the house, and breaking down the outward gates, he jumped from bed, and he and a footman named Joseph immediately armed themselves with fowling-pieces. The officers and other parts of his family soon joined him. The stairs of the castle were straight and narrow, so that from the first landing-place an obstinate defence might be made against the assailants. The duke, notwithstanding the time of the night, and the suddenness of the attack, preserved the most perfect coolness, and made the ablest dispositions for resistance; his officers and servants were to load the fowling-pieces under cover, while he, alone, at the head of the stairs, successively discharged them, with an effect the more to be relied upon from his being an excellent shot.

'The house was soon surrounded; the assailants broke the lower door, and seemed to be about to ascend the stairs, where some of them would have received the reward of their temerity, when the duke's first gentleman, a baron Grinstein, threw himself upon him, caught him in his arms, and exclaiming, that all resistance was vain, dragged him into a room which opened upon the head of the stairs. The assailants seized the opportunity; they rushed forward, and the duke, still palsied by the prudent care of Grinstein, was, with all the other persons in the room, made prisoner. It has never, to this hour, been ascertained whether the baron was actuated by a criminal motive; the fact of his interference is all we can vouch for; the duke would certainly have been finally overpowered, and one cannot help wishing, on the first impression, that he had had the satisfaction of dying amidst his dying enemies with his arms in his hand; but Providence ordained for him a still nobler fate, and fraught with a nobler lesson. Had he died in that midnight scuffle, the atrocity of Buonaparte might have been doubted; the cool heroic devotion of the young and gallant victim would not have been tried and proved; the deep and lasting indignation of Europe would not have been excited; and the retributive justice of heaven, in the fate of Murat and Buonaparte, would have wanted its highest effect, its most exemplary vindication.

'When the French entered the room, their first question was, Which of you is the duke d'Enghien? no answer was made; none of the prisoners were more than half dressed, except Grinstein, who it seems had gone to bed that night without taking off his clothes. Seeing him completely dressed, while the others were nearly as they had sprung out of bed, the French fancied, or pretended to fancy, that he was the duke. If he had had the honesty and presence of mind to say, I am the duke, he would have been carried to Strasburgh:—probably no harm would have happened to him, and the prince might have been saved. Grinstein, however, though he received a hint to this effect, was silent; and the French marched the whole party out of Ettenheim. The town was by this time in a state of consternation, and the princess Charlotte de Rohan alarmed at the noise, having risen and run to a window, saw, but it is supposed without recognising him, the duke dragged past her house, with no other covering but a waistcoat and loose trowsers, and a pair of slippers.

'At a little distance from Ettenheim, they halted at a mill where was the burgomaster of the town, whether it was he or the duke's secretary (who had followed his master and begged to be allowed to share his fate) who pointed out the duke to his guards, is doubtful, but he was now known. He asked to be allowed to send his valet back for linen, clothes and money, —it was granted,—on the servant's return, he dressed himself, and they proceeded. They passed the Rhine between Cappell and Reinau, at which latter place there were carriages waiting for them. The French wanted to place Grinstein in the duke's carriage, but he refused to be so accompanied; and insisted upon having the brave and faithful servant who had endeavoured to assist him in the defence of the house. On their arrival at Strasburg, the prisoners were confined in the citadel, and it would seem that the

jailers had not yet final orders as to the disposal of the duke; probably Caulaincourt had not returned from Offenbourg, whence he had directed the operation. The prince was, however, respectfully treated that day; but in the middle of the night his bed was surrounded by gendarmes, who forced him to rise and dress himself with all haste, as he was about to go a journey. He asked for the attendance of the faithful Joseph: he was told he would not need it. He asked to take some linen: he was answered that two shirts would suffice. This sufficiently explained to him his intended fate. He distributed to his attendants, who had now assembled round him, all the money he had, except one rouleau, and a few loose pieces of gold and silver; and, after he had affectionately taken leave of them, they were excluded from the apartment; but they heard for some minutes the noise of the preparation for departure, and amongst the rest the clank of the chains with which they had the needless barbarity and insolence to confine his arms.

'He was five days and five nights on the road during the whole of which time he was confined to his carriage, and almost without food. At the ordinary rate of travelling he might have reached Paris in seventy hours; so that some precautions must have been taken that he should arrive in the evening. It was about half-past five in the evening of the 20th of March that the young prince arrived at the castle of Vincennes, when he was delivered into the hands of the governor, who, at first, as well as the other persons, was ignorant who he was. By one of those slight incidents, which sometimes add an interest to a scene already deeply important, it happened that the wife of the governor was the daughter of the duke's nurse, and she recognised her foster-brother; overwhelmed with sorrow and consternation, she had yet the presence of mind not to betray herself, and retired, unobserved, except by her husband, to give vent to the emotions of terror and grief, and to endeavour to consider how she could be of use to the unhappy prince. The name of the royal prisoner was however soon whispered, and, as he complained of hunger and fatigue, all the inhabitants of the castle, even the officers and men of the regiment in garrison there (s'empressèrent), vied with each other in showing him attention. This alarmed the persons to whom the direction of the criminal was committed; the regiment was immediately ordered under arms, and marched off to the heights of Belle Ville, where it bivouaqued for that night.

'In the meanwhile, a mock tribunal assembled in one of the rooms of the castle. We devote to the scorn and detestation of posterity these bloody and cowardly assassins. They were

General Hulin, President.
Colonel Bazancourt.
Colonel Barrois.
Colonel Guiton.
Colonel Ravier.
Colonel Rabbe.
Captain D'Autancourt, Judge Advocate.
Captain Molin, Secretary.

All,' says the sentence, 'named by the general in chief, Murat, governor of Paris.'

'The members of this court had received the notice to attend not more than an hour before the appointed time, and they did not, with the exception of the president, know for what purpose they were summoned. Nor was it necessary they should; the sentence was ready drawn before they arrived, and the grave was actually dug before the court was assembled! Worn out with fatigue, the victim was asleep on a soldier's bed on the floor of his dungeon, when he was called to attend the court. He was awakened with great difficulty, and he entreated to be allowed to sleep again; but, as soon as he was made to understand that his hour was come, he shook off his fatigue, and prepared with a dignified alacrity for the last scene of his agony. He was introduced into the room where the court was sitting. He was asked his name: he told it. He was asked whether he had not borne arms against France: he answered that he had served the king; but when they were about to propose some other questions, he said he supposed he had told enough for their purpose, and that he would answer no more. He was then led away, and Hulin produced the sentence ready drawn up, and laid it before the astonished members for their signature. The whole scene had been so sudden—their ignorance of what they came for—of whom they were to try—the name of the young victim, which fell like a thunderbolt amongst them; all contributed to disorder their minds, and the ferocious threats of Hulin, the organ of Buonaparte and Murat, the latter of whom was present in the castle to execute them, overwhelmed their consciences, and they signed the fatal paper. We do not pretend to excuse their meanness, but we know that some of them set no bounds to their self-reproaches, and to the remorse with which they recollected that terrible scene. The bloody Hulin said, with atrocious sang froid, 'if the prince had not told us his name we should have been prettily puzzled what to do, as there was no one who could identify him.' This wretch was soon after, as the price of blood, rewarded with the office of governor of Paris, vacated by Murat's promotion to an imperial principality. In this pretended trial no witnesses were produced, nor any evidence but some papers, which are stated in the sentence to have been secretly read to the court before the prisoner was introduced.

'The moment the sentence was signed, the duke was led down to death. The night was pitch dark; the executioners could not see their victim, nor their own leaders, nor one another. The duke asked for a priest, it was refused;—he then knelt down near a square stone which happened to be there, crossed his arms, bent his head, and was for a few moments absorbed in devotion. He then requested that a lock of his hair, which he had cut off and folded up, might be delivered to the princess de Rohan—no answer being made, he exclaimed, 'Is there no French soldier who will perform this last office to a dying comrade?' One of the guard cried, I will; he received the little parcel; but neither that nor the generous soldier was ever heard of more.

During all this time, two persons stood on the rampart above the ditch, leaning over the parapet; to them the duke's demands were referred, and they, from time to time, directed the operations of the people below—these two persons are supposed to have been Murat and Savary—Murat—the hour came when he must have remembered this dreadful scene with bitter sympathy! At last, a little before midnight, the duke was placed in the ditch, with his back to the wall; he asked to give the fatal word of command—he was refused. At ten paces the soldiers could not see him; a lantern was therefore brought, which he himself tied to his button-hole. At the word fire, the duke rushed forward on the muzzles of the musquets, and fell dead at the feet of his executioners. The body was immediately taken up—unstripped and even unexamined—and flung carelessly into the grave, which had been dug before the trial. A stone was thrown into the grave near the prince's head. It has been said that this was the cowardly vengeance of one of the executioners, whose cruelty was not assuaged even by the victim's blood; but the person who filled the grave declared, that he had himself thrown in the stone as a mark to know the body hereafter. A little dog of the poodle kind had accompanied the duke; in the confusion of the trial and murder he was not thought of, but on the return of light he was found howling on the grave of his master. The poor creature was with difficulty removed from the spot; a gentleman purchased him from the man who had taken him, and protected him for many years out of affection to the memory of the unhappy prince.'

Our readers will excuse us for adding, from the same source, a few words descriptive of the finding the remains of the duke.

'On the 20th March, 1816,—the twelfth anniversary of the murder—a commission, appointed by the king of France, attended at Vincennes to search for the grave. The man who had been employed to dig and fill it up was still alive, and several persons who had visited it shortly after the event, recognised the spot. After digging about four feet deep, the boot of the right leg was discovered, and then the rest of the body successively, and lastly the head, and the stone which, before the grave was opened, the laborer stated that he had thrown in. All the bones were found. Their position showed that the body had been carelessly thrown in. It was lying rather on the face, with the head downwards, the left leg and arm bent under the body, and the right leg extended and the right arm elevated. It had been stated, by the laborer, before the search began, that the body had not been rifled; and in consequence of this information, the Chevalier Jacques—(who had been aide-de-camp to the prince, and accompanied him to Strasburg, but had been then separated from him and brought to Paris alone, where he suffered a long and rigorous imprisonment)—declared what the duke had about him when they parted, and what of course ought to be found in the grave; and it is impossible to describe the deep interest, the solemn impatience in which the commissioners, who stood around the trench, awaited each successive report of the surgeons who stood in it, and who examined every thing as the earth was turned up.

'They found about the middle of the skeleton a mass of metallic matter, of the size of a watch, but so decayed, that but for some small iron keys and a seal with the arms of Condé which adhered to it, it would have been hardly recognized;—the seal was perfect. A small red morocco purse with eleven pieces of gold and five pieces of silver. Seventy pieces of gold coin, the contents of a rouleau which M. Jacques had handed to him at the moment of their separation—the fragments of the seal of red wax on the ends of the rouleau were found, which bore the impression of the seal of M. Jacques. A ring and chain of gold, which M. Jacques declared the prince always wore about his neck, and which was found around the vertebral bones of the neck. In short, no doubt remained that the remains were those of the duke d'Enghien—they were accordingly placed in a coffin, and deposited, with the usual ceremonies of religion, in the chapel of the castle of Vincennes.

'Thus concludes the history of this bloody tragedy,' says our critic, 'the excuses for the perpetration of which only show us that Buonaparte's impudence was equal to his cruelty. The whole charge against the duke was, that he was in league with England in a conspiracy against Buonaparte;—if it had been true, Buonaparte had no right to violate treaties and the laws of nations to seize him—he had no right to try him before a packed court, chosen by Murat—to condemn him without a single witness being heard against him—and to execute him in the depth of night, with no other light to guide the executioners than a lantern fastened to his button-hole. But the alleged fact is altogether false. It is well known that England had no hand in the French conspiracies against him, —it is equally well known that the duke d'Enghien was wholly unconnected with, and ignorant of them.'

ENGIA, Egina, or Eyina, an island of European Turkey, in the gulf so called, near the coast of the Morea; anciently called Oenone, Ægina, and Myrmidonia. It is about thirty miles in circumference. Many fine relicts of antiquity are still to be seen on it. See Ægina.

# ENGINEERING

EN'GINE, *n. s.* & *v. a.* ⎫ Fr. *engin*; Ital. *ingegno*, *inganno*; Span. *engano*; Port.
ENGINEER', ⎬
EN'GINERY. ⎭

*ento*; Lat. *ingenium*, a device or contrivance. machine, instrument, or tool of art; applied various particular senses, as to military torring, steam-engines, &c. Enginery has a general application, but is particularly used by Milton for artillery, and the art of managing it. An engineer is either a maker or conductor of engines. Chaucer uses the word engine as a verb, signifying to torture.

> And right anon the ministres of the town,
> Han hent the carter, and sore him pined,
> And eke the hosteler so sore *engined*,
> That they beknew hir wickedness anon,
> And were anhanged by the neck bon.
>
> *Chaucer. Cant. Tales.*

> Recken you neuer of her fauoure sure:
> Ye may in clowds as easily trace an hare,
> Or in drye lande cause fishes to endure,
> And make the burnyng fyre his heate to spare,
> And all thys worlde in compace to forfare,
> As her to make by craft or *engine* stable,
> That of her nature is euer variable.
>
> *Sir T. More.*

> For 'tis the sport to have the *engineer*
> Hoist with his own petard.
>
> *Shakspeare. Hamlet.*

The sword, the arrow, the gun, with many terrible *engines* of death, will be well employed. *Raleigh.*

Prayer must be divine and heavenly, which the devil with all his *engines* so violently opposeth. *Duppa's Rules for Devotion.*

> This is our *engine*, towers that overthrows;
> Our spear that hurts, our sword that wounds our foes.
>
> *Fairfax.*

> We saw the foe
> Approaching, gross and huge, in hollow cube
> Training his dev'lish *enginery*. *Milton.*

> Some cut the pipes, and some the *engines* play;
> And some more bold, mount ladders to the fire.
>
> *Dryden.*

> They had the' especial *engines* been, to rear
> His fortunes up into the state they were. *Daniel.*

> Him thus enraged,
> Descrying from afar some *engineer*,
> Dext'rous to guide the' unerring charge, designed,
> By one nice shot, to terminate the war. *Philips.*

An author, who points his satire at a great man, is like the *engineer* who signalized himself by this ungenerous practice. *Addison.*

Had the vast sums which have been laid out upon operas, without skill or conduct, and to no other purpose but to suspend or vitiate our understandings, been disposed this way, we should now perhaps have an *engine* so formed as to strike the minds of half the people at once in a place of worship, with a forgetfulness of present care and calamity, and a hope of endless rapture, joy, and hallelujah hereafter. *Spectator.*

> He takes the scissars, and extends
> The little *engine* on his fingers' ends. *Pope.*

Such an army, however, far from being an *engine* at the king's disposal, was often no less formidable to him than to his enemies. *Robertson. History of Scotland.*

Whenever our neighbour's house is on fire, it cannot be amiss for the *engines* to play a little on our own. Better to be despised for too anxious apprehensions, than ruined by too confident a security. *Burke.*

> Who, kindling a combustion of desire,
> With some cold moral think to quench the fire;
> Though all your *engineering* proves in vain,
> The dribbling stream ne'er puts it out again.
>
> *Cowper.*

> Self-moving *engines* by unbending springs
> May walk on earth, or flap their mimic wings.
>
> *Darwin.*

*An* ENGINEER, in the military art, is more properly said to be 'an officer who has the care and construction of all works of both defence and attack.' Many things are requisite to form a good engineer. He should be a man of quick parts, vigilant, brave, active, and ingenious; and he ought to be particularly well skilled in the theory of all those sciences which belong to his art. His knowledge of fortification ought to be such as not only to enable him to discover the defects of a place, but to find a remedy for them; as also how a place may be most advantageously attacked or effectually defended. When at a siege he has narrowly surveyed the place, he is to make the result known to the general; acquainting him what part he judges to be the weakest, and where approaches may be most successfully made. His business is also to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, and that so as none of the works be flanked or discovered from the place. Thus it is evident that the art of an engineer stands in need of many others; its object is so extensive, and its operations attended with so many various circumstances, that it is scarcely possible for a man to make himself master of it by experience alone, even though born with all the advantages of genius and disposition that could be supposed necessary for the knowledge and practice of such an art. Experience, it must be allowed, is often more beneficial than all the precepts in the world; but, with all its advantages, it has also its defects: the fruits of experience are of slow growth; and the engineer who has contented himself with pursuing only that method of instruction, will often find himself puzzled at the moment when he should act. Much, however, of what experience would teach, through errors committed, may be learned at the expense of others from theory. The fundamental principles of this art are found in arithmetic, algebra, geometry, mechanics, hydraulics, &c.; and how fluently soever we may express ourselves in speaking, or writing, we can never give so perfect an idea as by an exact drawing; often therefore, in fortification, both are wanted; for which reason the art of drawing is indispensably necessary for engineers.

'To the qualities above mentioned,' says major James, 'must be added activity and vigilance, both which are absolutely necessary in all operations of war, but especially in the attack of such places as are in expectation of succours. The

besieged must have no time allowed them for consideration; one hour lost at such a juncture often proves irreparable. It is by their activity and vigilance, that engineers often bring the besieged to capitulate, much sooner than they would have done if those engineers had not pushed on the attack with firmness and resolution. Want of vigilance and activity often proceeds from irresolution, and that from weakness of capacity.' The office of engineer requiring such great natural qualifications, so much knowledge, study, and application, it is but reasonable that he should be exempted from all other duty, and that his pay should be suitable to the merits of his station. The word may be said to be of modern date; for, in the year 1600, persons acting as engineers were called trench-masters; and in 1622 Sir William Pelham, and after him Sir Francis Vere, officiated as trench-masters in Flanders. In 1634 an engineer was called camp-master-general, and sometimes engine-master, being always subordinate to the master of the ordnance; but about 1650, captain Thomas Rudd had the title of chief engineer to the king. In 1807 the corps of royal engineers in England consisted only of one colonel in chief, one colonel in second, one chief engineer, three colonel commandants, six colonels, twelve lieutenant-colonels, &c.; nor is the present establishment of this corps much larger.

Engineering, Civil, in contradistinction to the same profession attendant on military works, is of considerable importance to society; the occupation of the civil engineer embraces pre-eminently canals and their attendants, reservoirs, locks, basins, aqueducts, tunnels, bridges, docks and buildings in water, erecting beacons and light-houses, the cutting and forming roads, making iron rail-roads, &c. &c. To make the expert engineer requires considerable talent in the individual, joined to great personal firmness, and cautious enterprise. He should be a mathematician of the first order, with a ready aptitude of extending its powers to practical purposes; experienced in local nature, with science at command competent to assist and improve her.

The cutting of canals is in point of importance the first in order of his pursuits, and is of a very early date: for we find the Cnidians, a people of Asia Minor, projecting an undertaking of this nature: they wished the isthmus, which joined their territory, to connect itself with the continent. The oracle was consulted, and it was interdicted (Herodotus, l. i. c. 174). Basins and canals were formed in Bœotia, says Strabo, supplied by the lake Copais. The great river Euphrates was connected with the Tigris by means of a canal. A branch was also formed by Trajan near Coche, to join the same river. The Greeks, as well as the Romans, formed the design of making a canal across the Isthmus of Corinth, which joins Achaia, for the purpose of obtaining a passage by the Ionian Sea. A similar plan was projected between the Euxine and Caspian Seas. The Roman generals were fully impressed with the utility of canals, of which they executed many, as the ruins now existing demonstrate They connected the Rhine with the Iosel, and also the former river with the Moselle. Savary says, the canals in Egypt amounted in number to eighty, but they were more for the purpose of irrigation than communication. The Nile was joined to the Red Sea by an artificial channel; the work was commenced by Necos, who was followed by Sesostris and Darius; but the latter relinquished the undertaking on the information reaching him, that the Red Sea being so much above the level of the land in Egypt, it would be difficult if not impossible to prevent the overflowing of the banks, and consequent inundation of the country Under Ptolemy II. the undertaking was completed. Its width was upwards of 100 cubits, reckoning twenty-two inches to each cubit; and its depth sufficient to allow of the navigation of the largest vessels. By this canal India was enriched with the commerce of Egypt, Persia, and the coast of Africa. China, in her institutions hostile to art, has nevertheless encouraged the making of canals; and, their convenience having aided in supplying a ready transit of her commodities, she has, more perhaps from cunning than a wish to develope the powers of the human mind, intersected her country with them. The canal which runs from Canton to Pekin is in length upwards of 800 miles, and was executed about 700 years since: it has no locks, tunnels, or aqueducts, and when stopped by mountains, or other impediments, a rolling bridge is resorted to, and sometimes inclined planes. These rolling bridges consist of a number of cylindrical rollers which turn easily on pivots, and are sometimes put in motion by a windmill, so that the same machinery serves a double purpose, that of working the mill, and drawing up vessels. In this manner they draw their vessels from the canals on one side of the mountain to the other. In Europe, the nurse of science and the arts, to which in a great measure must be referred the successful completion of all great works, artificial rivers have abounded. In the year 1666 Louis XIV. gave directions for constructing a plan to connect the ocean with the Mediterranean by the canal of Languedoc. This was a bold undertaking if it be considered that all the details connected with it were to be created; every thing was new; Francis Riquet was the engineer, and he lived to complete it. This canal is upwards of sixty-four leagues in length, and is furnished with 104 locks. It runs through rocks in some places of 1000 paces in extent, in others it passes valleys and bridges by means of aqueducts of vast height. It joins the river Garonne near Thoulouse and terminates in the lake Tau, which extends it to the Port of Cette. It was begun by forming a large reservoir 4000 paces in circumference and twenty-four deep, which was supplied by water issuing from the mountain Noire.

In Germany, and the Low Countries, canals form the principal means of communication between one place and another. The canal of Bruges runs to the sea at Ostend, and is extended to Ghent, Brussels, Antwerp, and many other places. it is in depth sufficient to allow of merchantmen coming to the warehouse of its owner. These canals pass into the very streets of the above-named towns; indeed in all Flanders and

Holland, in towns of any importance, the streets are intersected by the canals. In the line of the canal the street is sufficiently wide to admit of two commodious roads on its sides, which are not unfrequently planted with double rows of trees.

Canal navigation in England may almost be said to have been commenced by the late duke of Bridgewater in the year 1759; since which time, the internal commerce having increased with the development of the industry of the people, canals have been cut in all directions, and afford a ready transit to every populous part of the island.

We propose to treat this and the various branches of civil engineering mentioned in this paper in a practical manner. The engineer entrusted with the making of a canal should be regarded as having so much of the projectors' interest at stake that the fullest confidence should be placed in him. The preliminaries to an undertaking of this nature, consist in forming a minute survey of every part of the country through which the line of the canal is proposed to pass; and this should be done in the first instance by the principal engineer: all the great heights should be accurately noted and ascertained; memorandums should be taken of all objects within the districts through which it is intended to pass; rivulets and mill-streams marked so as easily to be referred to; and the breadths of the various summits or ranges of high and low land that are to be passed accurately ascertained. When a survey is so far accomplished, a rough sketch or map should be prepared, laying down to a scale every principal object within the proposed line. This map will enable the projectors to see the various obstacles to be encountered in the work. When so much is accomplished, the advisable height of the summit-level of the canal must be ascertained in order to find the number and fall required in the several locks necessary to be constructed on its line, the proposed summit-level should be traced along the hills and ranges of high land, to see how far it is practicable to reduce it to the required height by filling up the low land by the excavated earth, or by deep cutting or tunneling. When the summit-level is finally determined on, and the line of the proposed canal, all springs and rivulets which rise above or cross this line should be traced, and the quantity of water they discharge accurately gauged: this part of the work is of the very greatest importance, as it may be turned to considerable account in affording a supply of water to the line in its neighbourhood. Mr. Eytelwein, engineer to the king of Prussia, has shown many important facts connected with this part of the subject, deduced from experience and mathematical investigation; and Dr. Young has given them to the public through the medium of the Journals of the Royal Institution; or see Nicholson's Journal, vol. iii. p. 25. In setting out the canal, a good spirit level with telescopic sights is required for tracing the levels, and when traced they are marked particularly by what is termed a bench-mark, which is no more than stakes driven into the ground at usually the distance of every two or three chains, with their tops exactly projecting above the earth so much as to ascertain the top-water level. After this line shall have been thus traced, and the bench-marks fixed, it should be accurately revised, and all sudden bends in its course rectified, so as to produce an easy undulating curve; it would be desirable to get the line as straight as possible, but ranges of high-land, and property of particular descriptions, sometimes intervene which prevents it. In such cases, as in the former for instance, it is often found more desirable to bend the line than to have recourse to deep cutting or tunneling: in the latter description may be included gentlemen's parks, gardens, &c., and where canal acts protect such property, the line must of course vary so as to pass round them. The widths and depths of canals vary in reference to the boats intended to work in them; thirty feet is a good width at the summit-level; and it is sometimes varied with us to as low as eighteen feet. In Holland they make theirs from fifty to seventy feet, and sometimes more. The Bruges Canal is eighty feet wide and sixteen feet deep. The slopes to the sides of canals are of considerable importance, and this consideration has given rise to many speculations, which have added very little to the stock of information already collected. Mr. Eytelwein has recommended that the breadth at the bottom should be two-thirds of the depth, and at the surface ten-thirds; the banks will then be in general capable of retaining their form. The area of such a section is twice the square of the depth, and the hydraulic mean depth two-thirds of the actual depth. See Nicholson's Journal, vol. iii. p. 33. The practice in our canals is to so apportion the side slopes that one foot in depth will give a horizontal base of one foot and a half. The depth of the water must be in some measure deduced from the nature of the soil to be cut through, and the draught of the boats to be employed on it. The average depth of our canals is between four and eight feet, and the banks are made one foot higher than the water is intended to stand in them. The fall given to a canal, in order to produce a stream or velocity in the water, varies with the local difficulties to be overcome; and, since inland navigation is determined to a precise point or place, the navigator calculates little upon the velocity of the stream downwards, knowing if it were made great what he might save in going down it would be lost in returning. Four inches in a mile is conceived to be a good fall for a canal eighteen feet upon the summit-level, and seven feet at bottom, and four feet deep; the velocity of the stream in such a canal is, according to Professor Robinson, seventeen inches in a second at the surface, fourteen in the middle, and ten at the bottom: from such a deduction it will not be difficult to extend the calculation to canals of greater or less dimensions. This conclusion is, however, only true of a straight river flowing through an equable channel; and as our canals are seldom straight for a mile together, but vary their course as frequently as change of place presents new difficulties, it follows, that the banks of the canals will be more often in a curved direction than a straight one; and Mr. Eytelwein anticipating such a

circumstance, remarks, 'that the velocity is greater near the concave than the convex side; a circumstance probably occasioned by the centrifugal force accumulating the water on that side.'

When a canal is accurately marked out, and the bench-marks firmly fixed, if it be found difficult to keep the bench-marks in their places, holes must be dug to supply their places, and the bench-marks put up as the excavating proceeds. When the works have arrived at this state, calculations should be made of stuff wanted, or to be spared, upon the line, in order to its being removed with as little labor as possible. The top-soil and turf removed, allows of the canal line being easily worked upon.

The ground-men, excavators, or navigators, as they are called, are in some districts also called bag-masters; to these people the digging is let, at per cubic yard, according to the nature of the soil to be excavated, and the distance it is to be removed. Their tools consist of (if in a clayey or loamy soil) a grafting tool, the handle of which is rather long, with a narrow blade of iron, forming the segment of a circle, with its concave side turned inwards, firmly riveted to the handle, and very thin at the lower end; the size varies to the caprice of the workman: they are usually about ten or eleven inches long, and six or seven inches wide. In some soils, gravel for instance, the same kind of tool is called a shovel; its blade is ground away till its lower end approaches an apex, the diverging sides from which form the slant ones, and make nearly an equilateral triangle. They have also a scoop to throw water, pickaxes, and wheel-barrows. The latter differ materially from the common machine of that name: it is framed of oak, the two sides form the handles, and also diverge away and admit the wheel between their opposite ends. Into the sides, two stout feet are framed and cross-braced: the whole is fixed together by stout bearers mortised into the sides. The bottom is lined commonly with inch elm boarding, and the sides slant all round, and are about six inches deep. The wheel is usually of cast iron, very light, and its edge not more than an inch in thickness. The beauty of the barrow consists in its lightness, and should not exceed forty pounds in weight, including the wheel. The laborer wheels the soil away in his barrow by a kind of tram-road made of planks, these being easily adjusted to all required positions.

Among the first works to be excavated should be the foundations for all locks, basins, and bridges, also the culverts and drains which are to pass under the canal. The work should be commenced as early in the spring of the year as possible, in which case many parts may be accomplished in sufficient time to allow of its settling and getting firm and dry before the winter season arrives, which, if severe, may delay its progress, and destroy such as may have been too recently set about.

The soils, through which the different lines of the canal is intended to pass, should be pierced and proved to ascertain their nature, and if good water-tight stuff, its extent traced, for on this must be determined where, and in what quantity, puddling may be required for the banks; for to prevent leakage in a canal, is that in which the engineer will display his greatest sagacity. Porous soils, or soils requiring puddle-lining, consist of gravel, sand, loose or open rock, or other earths that will let water easily through; or earths in which rats or moles take up their habitation, or such as is much perforated by worms.

Some engineers have made use of strong clay for puddling, but it has been seldom found to answer the purpose, particularly to side linings; in lining the bottoms of canals it has a better chance of succeeding. It holds so much water, that exposure to the air evaporates it, and consequently it cracks, which renders it unfit for a safe and water-proof coating, which in some canals is particularly required. The best puddle is made of a light loam, and sharp siliceous particles or sand, in the proportion of two of the former to one of the latter: it is manufactured commonly contiguous to the slope which it is intended to line, but if the bottom of the canal should require lining also, it will be necessary to so dig the puddle-ditch, or gutter, as it is called, that it may be at least three feet below the bottom of the intended canal. When the ditch is ready to receive the compost of which the puddle is to be made, the loam and sand, in the proportions above stated, should be brought and thrown into the ditch, till its bottom is covered to about twelve or thirteen inches in depth; it is then to be well covered with water, and it may stand so covered a day or two, if no particular hurry be required in facilitating the work. If expedition be required, the puddle-maker may commence his work immediately. The workmen are generally provided with a good and strong pair of water-proof boots; so equipped, they stand in the puddle-ditch. They are also supplied with a wooden chopper, or beater: the chopper is usually made of oak, with a rounded handle, and at its opposite end is the chopper, which is nothing more than a shaft worked away to an arris, and flat on its upper edge; with such an instrument they keep cutting and breaking the compost, at the same time treading it with their feet, till they get the whole completely incorporated and reduced to a tough and firm mass, and almost to a semi-fluid state all through the ditch, and, when so reduced, it is left to precipitate itself, which is effected in three or four days; and if, after having stood so long, it is found to have become settled and firm, not to give way by treading on it, it is deemed in a state to receive a second coat. When this is put into the trench, and the water let into it, the workmen should endeavour, in breaking it up, to strike their beaters quite through it, till they enter a small way into the coat previously prepared; in the same way a third coat is to be added, till the trench becomes full, and sufficiently high to reach the top-water or summit-level of the canal, or even a few inches more. When the puddling is so far advanced, the banks of the canal should be firmly made up, the towing-path formed to the proposed width intended, and the puddle should be covered by sods, and left for use; after which the banks of the puddle-ditch may be cleared away, and the lining of the sides commenced. Their slope

having been previously determined on, three feet is generally left to be supplied by the puddle-lining. In cutting down the slope, all extraneous matter should be carefully taken away, such as roots of trees and plants; all vermin holes should be well stopped and secured, and indeed every thing which is thought at all likely to disturb the coating about to be added; and when ready it should be worked down quite straight by the excavator's spade, and rendered tight and sound. After so much is done, the lining may be proceeded in, which consists in spreading on a coat of the puddle, varying from seven to twelve inches in thickness, all through the canal line, which is ready to receive it; and when this coat is properly laid, and to the satisfaction of the resident overseer, it should be sprinkled with water, and remain till the following day, when a second coat should be added, and so on, till the coating has assumed the necessary and required thickness; and when done it should be neatly smoothed down, and the water may be let into the canal.

The necessity of particularly attending to the puddle-lining cannot be too much impressed upon all those who may be concerned in canal works. Leakage in a canal is attended with so many embarrassing consequences; among them, loss of water is not the least, dilapidations of the embankments, and perhaps their being wholly carried away; for when percolation takes place, and that through made or artificial ground, its solidity is of very short duration. Nevertheless, it is but too often carelessly done; and this circumstance has led to an enormously extra expense, besides disgust in the contiguous land-owners, who have found their grounds constantly inundated by the leakage.

A canal is said to be performed by level cutting when the natural state of lands through which it has to pass is tolerably level, and approaching to a good summit-level to the next locks, both above and below it; when a line is to be cut through such grounds, nature is said to favor the undertaking, and it is, perhaps, truly said, for in Flanders and Holland the canals require no other consideration than in performing them in this way, and in them few locks are required, as a good summit-level may be accomplished by embankments, which are there called dikes. These, in countries like Holland, are of great consequence, and are commonly made wide and handsome, planted with rows of trees on their sides, and sometimes even paved; they are, in fact, the high roads of communication between one part of the country and another, and afford to the public the greatest accommodation, in giving them a dry and commodious road throughout the year, which could not otherwise be easily obtained in such swampy lands, which are more than half the year overflown by the swelling of the Rhine, and the consequent increase of water in the canals.

The Dutch have the credit of having invented the compost of puddling: it is true their canals are all so lined, and indeed without it, in canals such as theirs, it would be totally impracticable to prevent their leaking. Their embankments, or dikes, are sometimes raised twelve feet, or higher, above the neighbouring land, and the top-water level reaches within two feet of the top of the dike. The difficulty of keeping in the water, in such high embankments, must be great, where nothing but earth is applied for the purpose; but the Dutch puddle appears to make a complete barrier. The writer of this article has examined the principal dikes in Holland and the Low Countries, and he invariably found they were coated with puddle, and in a similar manner to the way described above for weak or infirm embankments, except, perhaps, that they are more neatly done than with us, and they use a kind of marly clay in the compost, which is often rejected by our engineers. Indeed, canal making, in Holland, is a system interwoven with the nature of the country. It would be a complete swamp if it were not for the canals: they perform the double purpose of facilitating inland navigation, and draining the country.

Plate I. fig. 1, ENGINEERING, is the section of a canal, showing it under circumstances of level cutting. A A the line of the contiguous ground; B, B, the artificial embankments; C C the width of the cut at top, and D D at bottom. The external slopes can be so formed as to be used for the towing paths. With respect to the slopes C, D, they are determined upon the principles already stated as prevailing among our best engineers for that purpose, viz. for every foot in depth, [illegible] a horizontal base of one foot and a half; [illegible] it follows, from such received data, that a canal six feet deep will require its sides to be sloped three feet, and, if it should be eighteen feet wide at the top water level, it would be fifteen feet at the bottom: hence may be deduced very useful proportions for canals of greater dimensions, [illegible] which may be combined the practice found of utility in the smaller ones.

Canals are cut through so many variations in the ground surface, that it would be impossible to anticipate them all: it is intended here, however, to notice two other cuttings, which will, in some [illegible], allow of great extension of application. When the ground slopes down to the projected canal line it is called side-lying; and, if a canal be forming through such ground, the work is said to be doing in side-lying ground. Plate I. fig. 2, shows the section of a canal for such cutting. A A the sloping line of the ground; B, B, the embankments to be raised; C C the width of the cut at top, and D D the width at bottom. It is of some importance to so arrange the cutting, that the ground excavated from the canal be equal to make up the embankments on its sides: it is impossible that it should be so in all cases, but a great expense may be saved if a calculation be made of it previously to setting out the summit-level of the work, as then the removal of the soil may be wheeled to the parts where it is most required, which will prevent heaps collecting about the works, which generates slovenliness, and sometimes the greatest inconvenience. Deep cutting arises when the canal approaches a hill, or the side of one, which it is intended to pass by deep or open cutting, rather than by tunneling. Plate I. fig. 3, represents the section of a canal by deep cutting; A A the inclined ground to be passed; C C,

width of canal at top, and D D the width at bottom; the sets-off I, I, are generally appropriated in such cuttings for the towing-paths, and are called by the navigators berms. They are also found to be exceedingly useful as a provision to prevent the loose ground which rolls down from the upper banks B and C from falling into the canal. It is in cutting in such situations that the ability of the engineer displays itself; he has often to contend with all the difficulties of a bad stratification, in which, frequently, the percolating waters become so great as to stop the proceedings. In such cases, pumps are had recourse to; but it sometimes happens, nevertheless, that he has no place into which he can convey the superfluous water, or, if he has, he is not sure that it will not increase his difficulties, rather than remove them. To offer expedients for such circumstances is impossible; they must be met by the experience and resources of mind of him to whom the work is confided, and it will be well or ill performed, in proportion as his experience and talent predominate.

Canals of great traffic must be furnished occasionally in their course with passing places. They consist in giving an increase of breadth to the water way of the canal, so as to admit of boats resting by the way, without incommoding the navigation; every canal has them, and the only precautions are, that they be made in as convenient places as can be, to promote the convenience of the traffic; hollow and low places are generally selected as the most eligible, and near to the locks and basins if possible. By such places being formed, the public derive accommodation, as it admits of a ready transit of produce and industry to the inhabitants in its neighbourhood. Reservoirs to canals, in most cases, are indispensable, in order to the keeping up a supply of water in its line; they are artificial collections, getting their water from every source in their neighbourhood; their size must be regulated by the quantity of wa[illegible] intended to contain, and that by the line of work which it may be intended to supply. They should be placed in situations so as to contain an equable quantity throughout the year, and so contiguous to the canal, as to admit of an easy communication with it at all times. Wherever the reservoir is to be constructed, all the variations of the ground's surface should be exactly noted down; the nature of the soil proved, in order to ascertain, if bad and porous, where, and in what quantity, lining or puddling may be required for it. The water flowing through all springs, brooks, and rivulets, which it is determined to divert, to supply the reservoir, should be exactly gauged, and also the depth of the rains which usually fall. All such particulars being ascertained, the excavation may be commenced; the same process is to be followed as has been recommended for the same kind of work in canals. The sloping of the banks is made rather more oblique than is practised for canals, commonly to every foot in depth a horizontal base of two feet, and, if the excavation be in a strong clay, the horizontal base is made as much as three feet. The lining is performed in a similar manner to the way pointed out for such work in canals. Every reservoir should be furnished with a gauge, indicating exactly the quantity of water that it can supply &c.; if the gauge be a wooden post fixed in the reservoir, it might be accurately divided, so as to show, by its divisions, the water lost by evaporation, or taken for the canal; and this gauge would exhibit at once how the supply kept pace with the consumption. In the event of an excess of water flowing into the reservoir, which circumstance should always be anticipated in its construction, many plans have been suggested for disposing of it; the most usual way, however, of providing for a ready exit to such excess, is to form a weir or weirs, sometimes called tumbling bays, frequently at the corners, if the form of the reservoir be square; if round, or a compound figure, at such places as is best adapted to its ready discharge. It will appear quite obvious, that the size and number of the tumbling bays must be regulated by the estimated quantity of water they may be called upon to discharge, or the greatest inconvenience may follow; as in the event of their being too small or too few in number, in great swells of the springs arising from unusual rains, &c., the sides of the reservoirs may be overflown, to the destruction of its banks and perhaps to the effect of blowing up and carrying away the canal works in its neighbourhood. The construction of a tumbling bay consists in forming a vertical syphon in the embankment of the reservoir, composed of well-wrought masonry or brick, properly cemented, to which a horizontal communication is opened by the side of the embankment of the reservoir. The whole workmanship should be done in the most complete and perfect manner; the bottom of the syphon should enter a culvert constructed in a similar way, which culvert or drain should be arched above and below, and be built upon an easy descent, so as to promote an easy discharge of its contents. The culverts are frequently carried under the bottom of the reservoir, in which case it will be essential to keep them sufficiently low to admit of the lining being thick enough to secure its water-tight qualities. In cases in which rivulets or other streams are diverted to the supply of the reservoir, a somewhat different construction will be required than when it is fed by springs; this difference principally consists in an alteration of the approach by which the water is to enter; such water is previously collected into a branch, or, as it is termed, a feeder, which is in fact a canal of smaller dimensions than the principal one. This feeder is constructed so as to promote a current in its waters to the head of the reservoir, which it enters by a weir or gates, the sides or piers of which should be formed of masonry, built on a piled foundation, in carrying up the work, which should be of large stones well joined, and the walls battering back from the line of their base, and somewhat curved in their whole height. The tops should be coped with broad slabs of granite or freestone, dovetailed together, or well cramped. The bottom of the weir should be formed by an inverted arch of masonry, well bedded in strong clay or puddle compost. The gates should be made of strong oak, with lower

and upper sills, framed with rails and cross braces, fixed in the stone sides by bars of iron. An iron upper rail should traverse the top side of the whole. The gate or weir should be in height a few inches above the summit level of the reservoir, that the water from the feeder may flow over the bar of iron attached to the upper sill. The reservoir supplies the canal by means of a pipe of cast iron, or other metal, or stone. This pipe is furnished with a cock which works on an endless screw, and is so adjusted as to be easily turned by the overseer of the reservoir.

Mr. Longbottom obtained a patent for the construction of reservoirs (see Repertory, vol. 4. p. 145), the only novelty in which was, he depended for a supply of water to the rains falling upon the earth's surface, which he proposes to collect together into one or more reservoirs; the words of the patent run thus: 'my intention is calculated to supply canals, ponds, sluices, towns, or any other place wanting water, by making reservoirs upon high and moorish ground, or any other suitable place which are to be supplied in manner following.' He adds farther, that 'he found that in twelve months there fall upon a superficial foot of land 3·33 cubical feet of rain-water, exclusive of exhalation, so that upon a statute acre there fall to the amount of 145,054,80 or thereabouts;' again, he says, 'I can convey water falling upon 3500 acres into reservoirs:' for instance, 'I make a reservoir of 100 statute acres in the most eligible situation, from which open drains, or sluices are made in the most proper places for receiving water running from the surface of the grounds in rainy weather, which, according to calculation, will be nearly equal to 5076 cubic feet per acre, or 91,800 cubic feet per annum, brought into the reservoir, except in loss by soakage; this may be done without any prejudice to rivers or mills. The area of a reservoir of 100 statute acres is 4,356,000 superficial feet, and the average depth 9·75; the parts are not included, so that 4,356,000 the area by 9, gives 39,204,000, as contained in the reservoir of reserved water.' For conducting such water into the canal or sluice, he says, 'I make two aqueducts of stone or brick for conveying the water out of the reservoir, from the bottom when the water falls perpendicular from its surface into the space of a large circle of stone-work, with which the openings of the aqueducts communicate; in each of these I fix a paddle or clough equal to an opening of fifteen inches by twelve inches, which is raised by a screw fixed to it, and moving upright in a piece of iron fixed across at the upper part of it; upon it is a square box including a female screw, in which the other moves, which is turned round by four small hand-levers fixed to the square box, and which rests upon a small iron bar, which raises the screw and also the paddle, to the following heights, viz.: with an opening of three inches by twelve inches may be delivered 317,952 cubic feet of water in twenty-four hours; with one of six inehes by twelve inches, 630,730 feet; with one nine inches by twelve inches, 927,936 feet: with one twelve inches by twelve inches 1,222,560 feet; and one twelve inches by fifteen inches, 1,512,000 feet, or a less, or a greater quantity, in proportion to the opening and velocity. The quantity of water required to be let out of the reservoir may be regularly ascertained, by fixing at the head of the screw a pointer, and an index above it accurately divided into inches and parts; and, as the paddle is raised by the screw fixed to it, the pointer at the end sliding upon the index will show the quantity of water discharged upon every division of it as set forth; as at three inches in height, 317,952; at six inches, 630,730; at nine inches, 927,936; and so in proportion to all the several proposed elevations.' This specification concludes with directions for forming smaller reservoirs, in which many ingenious suggestions are developed. The reservoirs here treated of have been considered as formed by embankments, which, in porous soils, have been recommended to be lined with puddling; in some, however, such embankments will not answer the purpose, in such cases the whole must be walled with brick or masonry, and if of the former, the greatest care should be taken that they be well laid, and of great substance, with puddle-linings behind them; the cement should be of fresh stone lime (and if ground instead of slaked with water the better,) mixed with sharp sand, and the mortar prepared for use only as wanted. The walls should batter back in their height, with a small curvature outside, diminishing in thickness as they ascend, and finishing finally at the top to two bricks and a half. The whole should be coped with granite, with the meetings fastened by dovetails. If it be determined to form the walls in masonry, which, in some situations, may be eligible from the abundance of stone at hand, the same plan in the form of the wall should be had recourse to; and also, in previously lining the embankments, the ashlerings should be in as large pieces as may be conveniently obtained, and all venty or bad stones rejected. The joinings should be as close as possible, with very little cement between them: the whole should be coped, as is directed before, for walls of bricks. Most of our canals are supplied by reservoirs somewhere in their course, so that an engineer can scarcely anticipate a work of canal-making without feeling that he may be called upon to exert his talents to the forming of a reservoir. Reservoirs that have been lately formed to canals are—one at Ripley for the Cromford Canal; another at Milstone for the Grand Junction; also, at Ainsworth for the Nottingham; at Marsden for the Huddersfield; at Littleborough on the Leicestershire Canal. The Rudyerd Vale supplies the branch of the Caldon and Mersey, and occupies upwards of 150 acres, and is more than thirty feet high. The St. Ferriol reservoir to the canal of Languedoc occupies a space of 590 acres; the walls of which are covered with ashlerings of freestone.

Locks, or pound locks, in the consideration of which many important circumstances develope themselves in the work of a canal, are the barriers by which the water is kept to its summit-level; in the several reaches on its line they also operate as toll bars for collecting the tolls payable on navigating it: they are placed as frequently on the line of the canal as the several levels require

them, and make a kind of step in the line throughout its course. They have been the great desideratum in canal-making among the moderns, as by the making of which, waters have been pent up in the reaches between them, supplying the means of navigation through high and low lands, from one part of the kingdom to another. In setting out a lock care ought to be taken to get their falls as equal as possible, and this can only be done by the previous care taken in adjusting the summit-level of the canal. The lock comprises of itself a chamber and two pairs of gates; the former is made of length and width adequate to admit one or more boats at a time either in ascending or descending the canal; this is effected by letting the water out of the chamber; if it be ascending, by opening the lower gates: but it is not usual to keep the lower gates of a lock shut, so that a boat or boats coming up the canal can be immediately towed into the lock, which, when in this state, is said to be empty, although it contains as much water at least as is in the lower reach of the canal; when boats have thus entered the lock, the lower gates are loosened, and the paddles of the upper gates are gradually raised, which admit the water to rush into the chamber of the lock: the velocity of the stream soon closes completely the lower doors: and when they are shut, the upper gates are regularly opened till the water has completely filled the lock, which it does in a very short time, and becomes at rest between the lower gates and the upper reach of the canal. The tolls being paid to the overseer of the locks, the boats are towed out, and if no others are waiting to descend the canal, the lower gates are opened and the upper ones are again closed, when the lock empties itself and regains its former state It will be perceived, that the upper line of the canal will lose its waters in proportion to the working of the locks, hence it becomes desirable to make them as small as possible; and it is also of importance that they should be of the same size throughout the line of the canal, that the loss at each lock may be equal, in which case the supply to be anticipated may be correctly ascertained. In the approaches to all locks, both above and below them, there should be made resting places, provided with oaken piles driven down close to the embankments, which they may be made to support, with their upper ends crossed by strong whaling boards of oak, bolted with iron bolts to the heads of the piles. If the whaling boards have large iron rings fixed in them, the bargemen will have the advantage of fastening their barge to them during the time they may have to wait for passing the lock. Twenty-five-ton boats, according to Mr. Fulton, consume, in ascending a lock of eight feet rise, 163 tons of water, and in descending the same, 103 tons; now, if such a datum be correct, it would enable an engineer to make very accurate calculations of the loss in water in all his several locks upon the proposed line of the canal; that more water should be lost by ascending a lock than in descending, appears probable, although the same space requires filling in both cases; but it does not appear so obvious, how so great a difference as sixty tons can take place; but this could be settled by a reference to the draft of the boat employed, knowing that it displaces as much water as its cubical contents, if it be laden adequately: these are all investigations pressing on the consideration of the engineer. Plate I. fig. 4, is the ground plan of a lock; A, A, A, A, strong piers of masonry or brickwork bonded into the wing walls, F, F, F, F; B the chamber of the lock; C, C, the gates; D, D, the side walls of the chamber; E, E, the vertical syphons to take off the superfluous water from the head of the lock. The building of a lock requires the utmost attention in all its constructive parts; when the form is traced out, and the top soil removed, the ground should be proved to ascertain its nature. and if soft and porous the foundations should be piled all through, the tops of the piling should be regularly sawn down and planked with oak of not less than three inches in thickness; which planking will form the platform on which the walls are to stand; in forming the foundation wall, some attention must be had to the inverted arch, which composes the flooring of the chamber of the lock. See section, plate I. fig. 5. The inverted arch, K, should be formed of hewn stone of small curvature; its thickness in the centre about two-thirds of that of its spring; the joints of the voissoirs are also all traced from the centre of curvature of the arch, and also the springing line; the bottom of the arch should lie upon a good lining of puddle, and the joints of the stones should be well cemented so as to be water-tight; the abutments, or bottom of the side-walls of the chamber, should be of twice the thickness to what they are above, and should rack-back in ascending; linings of puddle will be judiciously employed in covering the earth of the embankment behind the chamber walls. Lock walls are usually parallel to each other, and the lock varying in width from fourteen to eighteen feet, and in length from seventy to ninety feet. The plan, (plate I. fig. 4) is conformable to this proportion: the side walls of the chamber batter back as they approach the coping at their tops, about six inches from their perpendicular; and if they were made to have a slight curvature in their height, they would be much stronger for it. In building the piers, as shown in the plan at A, it is necessary to observe, that they should be out of large blocks neatly worked and hollowed out to admit of the gates working in them. The wing walls should be raised in a similar way to the walls of the lock, except that no provision is required in them to receive an inverted arch, as the approach or breast of the lock requires no such protection. Apertures should be made through the side walls of the wings to admit of the superfluous water entering the culvert through the syphon, as seen in the plan at E, and in the section by the dotted lines; and if the culvert be bent in its course, this water, if it be required, may be made to enter the chamber of the lock, a circumstance of some importance when there is a scarcity of water. When the lock is so far formed, and its syphons and culverts made, the lock sills should be put down; they consist in forcing into the ground, at the two ends of the bottom of the chamber of the lock, a row of narrow piles extending from one side to the other:

they should be driven as close together as possible, and, when so driven, they will form a chain across the two ends of the lock; in this state their tops should be sawn off quite level and smooth, and a sheeting, as it is called, of good oak or cast iron should be bolted on them with iron bolts, to form the lock sill for the gates to move upon, and also to protect the approaches to the lock. In the wing walls there should be inserted in their progress some large blocks of stone, projecting somewhat from the face of the ashlering of the wall, and called bumping stones, for the boats to strike against as they enter the approaches to the lock. The lock walls and those of the wings should be coped with granite, firmly fixed and cramped. The gates C, C, are made in two parts, and form at their meeting an obtuse angle; they move in the hollow quoin stones, and by means of iron joggles fitted into sockets, which should be let into the hollow quoin stones of the piers A. Plate I. fig. 5, is the section of the lock; GG the granite coping; HH the top of the sloping side walls; II the base of the sloping wall; K the inverted arch at the bottom of the lock; L, L, the syphons of masonry or cast iron, worked up in the wing walls at the head of the lock to carry off the overflowing water; MM the culvert or drain; N a cesspool to receive any matter carried by the water through the culvert, to prevent its overflowing or stopping up; O, O, the horizontal apertures in the wing walls communicating with the syphons L, L. These apertures should be made a few inches below the top-water level, and if formed in stone composed of a large block perforated quite through, and the size of the opening regulated by the quantity of water to be discharged, but they might be formed of cast iron with the best success. It will be unnecessary to add, that all the work of a lock requires the materials and workmanship of the very best quality, and the engineer will more develope his constructive talent in adjusting its form and the mode of putting the materials of which it is to be formed together, than he can in any other of the arrangements arising out of the works connected with canal construction. Plate I. fig. 6, is a pair of lock gates: they are shown to a larger scale than the plan or section of the lock which accompanies them, in order to exhibit the mode of their framing more obviously. They should be made of good seasoned oak, free from vents or sap, and are composed of several pieces known by the following designations: P, P, the balance beams; Q, Q, Q, Q, the rails; R, R, R, R, the vertical stiles; S, S, S, S, the braces; T, T, the paddle holes; and they are finally covered by oak planking, grooved into the bottom rail and the balance beam at top, the joints of which are also rebated, or grooved and tongued. In some lock gates the boarding is fitted in diagonally, in which case the braces may be dispensed with; but greater strength can be accomplished by framing them as shown in fig. 6, and there will be also a saving of wood. The scantling of the timber in the lock gates may be varied to meet the pressure they may have to sustain, but it will be indiscreet to attempt making them too light. The rails Q, Q, Q, Q, should not be less for ordinary purposes than ten inches in depth and six inches and a half in thickness, and this would be a very good scantling for the stiles R, R, R, R; and, supposing the planking to be two inches and a half, the cross braces S, S, S, S, would be properly proportioned to be left seven inches on the face by four inches in thickness. The balance beam, which also forms the top rail of the gates may be made somewhat larger in scantling than the lower framing, and the stiles might be framed into it. If this beam was made at its smallest end eight inches square, and at its opposite end ten inches and a half, it would act as a good balance to the gates, and give them great strength. The boarding should be flush on the upper side, and well spiked to the middle rail and also the braces. The projecting edges on the inside of the gates of the rails and braces should be splayed downwards in order to the water running quickly off them, and the balance beam should be weathered on its top edge. The iron work to the gates consists merely of its hinges, the sockets of which are previously inserted in the stone quoins of the wing walls. In fixing the iron work it should be made to lap quite over the outside stiles and be bolted with iron bolts, with nuts, and screws. Sometimes the bottom of the gates is shod by plates of cast iron and these plates are also continued up the centre stiles, and it must add great additional strength to the framing. Some have recommended the giving to the external form of lock gates a small degree of curvature, supposing, no doubt, that by such curvature they would give additional strength to the gates; but the momentum of form would be more than surpassed by the loss of strength in the materials, as cutting wood purposely circular so crosses its grain as to leave it with very little strength at its joining, besides a double expense in the actual cost of the gates themselves. It has been deemed proper to notice this circumstance to prevent theoretical engineers from disappointing themselves in the application of curvatures to wooden framings in which strength is sought; for it will lose strength by such curvature in a ratio of greater proportion than it can possibly gain it, which will be easily discovered by an inspection of the state of the fibre in circular wood framing.

The paddle holes T, T, are small openings left in each gate, generally about twenty inches square, and to which a small door is fitted; they are found of the greatest utility in preventing a too sudden swell in filling the chamber of the lock, and also in removing a portion of the pressure of the water from the gates when they are required to be opened in letting a boat descend the canal. They are so adjusted to the boarding of the gates that they can be easily raised or lowered by the overseer of the locks. This is done by supplying a guard bar to the top of the gate, which is operated upon by a rack and pinion, that has the effect of lowering or raising the paddle-doors at pleasure. Amidst the considerations arising out of the detail of a lock, it will be proper to notice that in long lines, and on which there is great traffic, sometimes there arises too great a scarcity of water to supply the upper reaches, in consequence of which many expedients have been recommended, and some have been had

*recourse to, to avoid the inconvenience. On the Grand Junction Canal reservoirs have been made,* to collect the waste water of the lockage, to which a steam engine has been erected, which pumps the water, after having emptied itself into the reservoir, back again into that part of the canal from which it has been lost. And there has been also another expedient recommended to remove the same inconvenience, under the designation of side ponds. A side pond or ponds consist in forming, on the right and left of the chamber of the lock, a number of projecting cisterns, varied gradually in their elevation, beginning a small distance from the bottom, at the lower end of the lock, and stepping up to the upper end or head of the lock, provided with paddle doors. These cisterns, in capacity, are made so as to contain all the water, or nearly so, that passes the upper gates on a boat or boats, ascending or descending the lock. When the chamber of the lock is full, the highest paddle-doors are opened, and the water empties itself into the cisterns right and left, and so on till all the cisterns are full, observing to shut the doors of the cisterns as the water retires in the lock; and this is done till the chamber of the lock is so emptied as to allow of its lower gates being opened. When the boat ascends or descends the canal, it will be seen by this plan that very little waste or consumption of water by lockage can accrue, except that which must necessarily be so by allowing a sufficient quantity in the bottom of the lock to keep the boat afloat and level with the lower level of the water of the canal. Mr. Playfair, an architect who gave rise to this invention, obtained a patent for it in July 1791; the specification of which may be seen in the Repertory, vol. iii. p. 303. In the patent the application is supposed to be employed under the following circumstances, for example: 'a lock is supposed to be constructed twelve feet deep, sixty feet long, and six feet wide,' and it is calculated that the quantity of water required to fill such a lock, to enable it to pass a boat is 4320 cubic feet, and in ascertaining what water may be necessary for supplying the canal, allowing for waste by evaporation and soakage, it is found (according to the number of boats that may be expected to pass), that there will not be above 800 cubic feet for each; and hence, it is added, it will be necessary to save five-sixths of the whole; to do which ten cisterns are directed to be made, each of which must be one foot deep, and each have a surface of 360 feet superficial. The aperture or entrance to the lowest cistern must be one foot above the level of the water in the lower part of the canal, and eleven feet under the level of the high water; the second cistern two feet above the level of low water, and the third three feet, and so on. It has been deemed desirable to quote so much of Mr. Playfair's specification to illustrate the application of side ponds, and it cannot fail of producing a conviction of their great utility to canal locks, whenever there is reason to anticipate a want of water, as generally the greatest source of its loss is by the lockage. By the application of side ponds, this inconvenience may be, in a *great measure, superseded, and at no grea additional expense to the works.*

Basins.—These are formed in all towns to which the canal has a communication, in order to make a commodious place for the boats to unload their cargoes and to take in fresh ones. Their size varies according to the importance of the town, or to the trade carried on at it. Surrounding the basins, a spacious area of ground should be gotten to admit of warehouses, cranes, toll-houses, and other stowage for goods, being built with adequate space for all the vehicles employed in the trade to receive a ready transit and exit in their business about the basin. Convenient approaches should be formed to the wharfs for carts, and also roads with the shortest and readiest way of their departing when laden or unladen. The toll-house should be placed near the principal entrance to the basin, and should consist of two or more rooms for the keeper, with an office and weighing bridge. In the office should be written, in legible characters, the different tonnage and other charges to be collected, by the keeper, of the persons who trade on or about the basin of the canal. The construction of a basin consists in forming a chamber or head, sufficiently capacious to admit of boats resting in it, with room to unload and retire. The size, as before observed, must be commensurate to the number of boats expected at the basin. The embankments should be quite level with the wharfs, on contiguous ground, and about one foot higher than top-water level. The termination of the basin is generally made to form a bow or semi-circle on the plan. All the enbankments are faced by walls of masonry or brick, and the tops should be coped with large blocks of granite. In raising the facings to a basin, the same precautions should be had recours to which have been previously recommended in the construction of the chamber of a lock; for instance, if a soft and porous soil, piling must be employed in the foundations, with a covering of oaken plank, and the earth enbankment must be covered with a puddle-lining previously raising the walls of the facing. The walls should be of great thickness at the bottom, racking back on their outsides and battering over on their insides; and their slope will require to be in proportion and parallel to the canal embankment, in order to the general surface of the lines approximating together. In carrying up the facing walls, nevertheless, a few niches of curvature to produce a swell internally in their height, would add greatly to their strength in resisting pressure. A basin must also be provided with a weir, syphon, or waste gate, in order to discharge the water constantly flowing into it from the upper reaches of the canal by waste of lockage, &c. If it be determined to discharge this water by a weir or syphon (perhaps more than one may be necessary), culverts should be made to receive the water and discharge it at the most convenient places; these culverts require executing in the most substantial manner to prevent their blowing up by the weight of water they may be called on to discharge. They should have also some cess-pools in their course to receive any solid or other

matter floated into them through the weir or syphon. Some basins are released from overflowing by a waste gate; this is the case with the basin to the Oxford canal at Oxford. This basin is so near the river Isis as to admit of an easy communication with it; and, availing itself of this circumstance, the bank between them has been pierced through, and the embankment at the piercing right and left has been faced by masonry. See plate I. fig. 7. From the waste gate, VV, the walls right and left are splayed off at the embankments of the canal approaching the basin, and turned circular at their opposite ends, a rebate is left in the masonry for the gates to hang in at W W. The tops of the walls are coped with strong freestone, and the gates X are of oak, but without paddles. Returning again to the basin, it will be necessary to observe that guard-rails are found necessary to be fixed against their walls to prevent the boats from striking against them. The guard-rails consist of a series of strong oaken piles driven down into the bed or bottom of the basin, slanting to the side of it at intervals of about ten feet; and on their facing near their tops are broad planks or rails of oak strongly bolted to them with iron bolts. These generally form a continued chain, traversing the whole facing or embankment of the basin. Iron rings are fixed into the rails or piles at convenient intervals, for the purpose of allowing the bargemen to lash their boats to, while taking out their cargoes. In some cases large stones are worked in the walls for this purpose, and called bumping-stones, to which rings may be fixed for the lashing to of the boats.

It will be necessary, in this place, to notice the several contrivances had recourse to for supporting the water in a canal, against accidents to its embankments, and other unforeseen events arising out of the imperfection of the means employed for such purpose. Safety-gates are among the expedients made use of in such a dilemma; they are a contrivance for stopping the water in a long line of a canal when there is danger of the embankments giving way. Plate I., fig. 8, shows the plan of a safety gate or gates: P, P, the walls of masonry or brickwork built in each opposite bank of the canal; R, R, R, R, piers of masonry to strengthen their extreme ends; E, E, small projections worked up to stop and hinge the gate to; K sinkings in the wall to admit of the gate laying in flush with the wall; D the safety-gate. The plan is shown with two gates, one for the purpose of supporting the water in the upper, and one also for the lower reach of the canal; and these can be shut as required by the repairs to be done, whether up or down the canal. These gates move upon the same principles as lock-gates, and require a similar contrivance, excepting that they are commonly in a single gate only. The walls of the safety-gate should be built on piled foundations of adequate substance at bottom, racking back outside, and battering inside, with a slight curvature: they should also be coped at their tops. The gates should be of good sound oaken wood, and prepared in a similar manner to lock-gates. See plate I., fig. 6. Advantage is sometimes taken, for the purpose of economy, of forming the safety-gates in the pier walls about the bridges, if bridges of masonry happen in eligible places for the purpose. They are of the greatest utility on a canal, and claim particular attention in arranging the most eligible site for their erection; and their mode of building should be of the most substantial kind. They are indispensable in long levels, to protract dilapidation, where the cuttings are much embanked.

There is also a contrivance of a similar nature called stop-gates, the construction of which does not differ materially from the safety-gate, except in its being made to lie flat at the bottom of the canal, instead of being balanced above, as is the case with safety-gates. The mode of raising the stop-gate is by a chain, which is fixed to the gate under water, and, when it is required to be raised, the chain is used for that purpose. Stop-planks are also often employed on canals for stopping water; they are a very simple contrivance, and consist in previously working up walls in the two opposite banks, formed with a groove or chase, into which the stop-planks are forced, and pressed down to the bottom of the canal. These answer the purpose effectually on narrow canals. Stop-bars are another contrivance, similar in manner to stop-planks, the walls for which are grooved to receive the bar. These are used as toll-bars, at the toll-offices on the canal line, and are to be so contrived as to be opened and shut by the overseers attending at the toll-houses. They may be esteemed the turnpike gates of a canal.

Aqueducts are frequently employed on a canal, for the purpose of extending it over rivers, and between two opposite ridges of high land. For this latter purpose they were often erected by the Romans, to convey water for their baths and fountains, as the ruins of many of which, still in existence, fully demonstrate. But the Roman aqueducts were never intended for any other purpose than to convey water for the people's use; hence they were confined in their dimensions, and were a little more than long narrow walls, with a void through them as a passage for the water. The aqueduct at Chapanost, near Lyons, is raised upon arches of masonry, on the tops of which is a narrow channel for the water, arched over at top, the size of which is six feet high and three feet wide, lined in the inside with a lining of strong cement about six inches in thickness, which is quite perfect even at this time. There is another at Montpelier, which passes the river De Baunon, and crosses the valley, of a similar construction. Louis le Grand ordered an aqueduct, which is built after the same manner, and which conveys the water to Versailles. They are also numerous in every part of Italy, and wherever else the Romans extended their power; but since the discovery of Galileo, which demonstrated the important effects of the weight and pressure of the atmosphere, aqueducts in the Roman manner have become useless; as his discoveries showed that water would not only elevate itself to the syphon line, but might be raised to about thirty-four feet above that line, by the means only of the atmospheric pressure.

Plate II. fig. 1, Engineering, is the plan of a design of an aqueduct bridge to cross a navi-

gable river, supposed of 300 feet wide. A, A, the piers; B, B, the wing piers and walls; C C C the water way; the longitudinal dotted lines show the course of the aqueduct in the superstructure. Fig. 2 is the elevation: it has been deemed proper to show a bridge of this description, with some reference to architectural design, which is too often neglected, when the expense would not be increased by attending to it, as whether a stone or brick is placed in one way or another, there can be no difference in its expense by such placing, but in this placing arises all the difference between the artist and the artisan. Fig. 3 is the cross section of the bridge; C the spring of the centre arch, showing the splaying sides and its intrados: H the solid masonry above the springing line; D, D, the embankments and towing-path to the aqueduct; E E the width of the water way at top; F F the width of the water way at bottom. The rounded parapets I, I, are proposed to be raised above the towing path right and left, as a protection to the passengers moving on the sides of the aqueduct. The construction of an aqueduct bridge requires all the talents necessary to be displayed in the erecting of other bridges, with the additional skill of giving to the road way water-tight qualities. The piers of a bridge of this description should stand on piled foundations, in order to give them the greatest firmness, and the usual process of erecting pieces of masonry in water should be followed. Caissons, or water-tight boxes, should be made to raise the piers in, until they are built above the top-water level; the abutment piers should be formed behind a coffer-dam, and the whole of these parts of the substructure should be raised to a similar height previously to raising the centering on which the arch is to be built. For a particular description of the caisson, coffer-dam, and other details connected with bridge-building, see the article MASONRY.

Stone is the eligible material for building aqueducts, inasmuch as a greater firmness will result to the parts, and without a firmness and equilibration in it, the aqueduct will be subject to leakage and dilapidation. The embankments at the two opposite ends or wings should turn somewhat outwards, to allow of more easy approach, as is common in most bridges. The sides or banks of the aqueduct, crossing the bridge, should be formed of solid masonry or brick-work, and of good substance, battered over as they approach their tops, and somewhat curved, which will add to their strength and solidity. The edges of the wall should be coped, and the banks or towing-paths paved. The lining of the aqueduct should be conducted in a similar manner to puddling, excepting only it should not be common lining of that nature. Parker's cement makes an excellent lining, and is perfectly water-tight: this might be laid on the masonry to a consistence of about an inch in thickness, smoothly spread, to the face of which a coating of common puddling might be applied, which together would be a secure protection against leakage.

The multiplication of canals in every part of the country, with the experience arising out of it, has produced the application of new buildings of various kinds in aid of them: and there has been an aqueduct erected to the Shrewsbury Canal, composed almost wholly of cast-iron, and which may be considered as the first of the kind ever formed. In the Rev. Mr. Plimley's Report of the Agriculture of Shropshire, is the following account of it:—'The canal passes the valley of Tern at Long, for a distance of sixty-two yards, upon an aqueduct made of cast-iron, excepting only the nuts and screws, which are of wrought iron; and I believe this to be the first aqueduct for the purposes of a navigable canal which has ever been composed of this metal. It has completely answered the intention, although it was foretold that the different degrees of heat and cold would be such as to cause expansion and contraction,' from which it was concluded to be improper for this purpose. It is necessary only to observe, that the objections to iron were founded in fact, as all metals are more or less influenced in their form by different degrees of temperature; and it was extremely probable, in the situation of an aqueduct, which is exposed so much to the vicissitudes of heat, cold, and oxidation, that it might turn out to be improper for that purpose. Time can only be the test of the propriety of establishing aqueducts of cast iron. Nevertheless, there are several at this time erecting, but, in some of these, there is a greater combination of stone, and also of wood, than has been employed in the one at the valley of Tern. Mr. Fulton, in his treatise on canal navigation, proposes that the 'butments and piers should be raised of stone, after which it will be necessary to extend pieces of timber across the span, and each to be traced back and covered with planks, to form a stage or scaffolding; on this is fixed the iron work of the aqueduct which may be all cast in open sand, and of the following dimensions; for instance, the span 100 feet, and the versed sine of the arch one-sixth of the span; then three segments of a circle, each in three pieces, about thirty-six feet long, eight inches by four inches diameter, and to be united; then three straight bars to extend from one pier to another, to be of the above diameter, may also be cast in three pieces, and which bars are to extend along the tops of the segments to the piers, and form a line parallel to the horizon. The bars and segments to be united by perpendicular stirrups, ten or fifteen feet distant from each other. The mortise in the lower end of the stirrup, being thirteen inches long, will be sufficient to secure the segment, and leave room for a hole two inches square, through which a cross brace is to pass and fasten the segment at proper distances. The brace to have a mortise cast on each side of the stirrup, in order to allow of tightening the work by wedges. The trough plates should be at least one inch thick; the side plates six feet wide, and as long as can conveniently be cast, which may be twelve feet, and perhaps more, the flange to be made outside of these plates. The bottom plates may be six feet wide and thirteen feet long, and, in order to support the horse-path, two of these plates laid across the stage and screwed together, with a flange under them, will compose a length equal to one of the side plates. The whole may in this manner be screwed together on packings of wool and tar, and the

seams pitched. On the plates composing one side of the trough, brackets about three feet from the top must be cast and fixed, in order to support the horse-path: perpendicular rails, eight feet long, being raised from the arms of the bottom plates will support the outside of the horse-path. It is added, that, by pursuing this method of forming an aqueduct of cast iron, very few patterns will be required; two will be sufficient for the trough-plates, and but few will be required for the springs, rails, and spurs.

Mr. Jessop undertook a most stupendous work of this kind on the Ellesmere Canal, for crossing the Dee River, in which are employed nineteen ponderous pillars of stone, at fifty-two feet distance from each other, the centre one of which is 126 feet high. On the tops of these pillars are supported a number of elliptical cast-iron ribs, which, by means of uprights and horizontal bars, support an aqueduct of cast iron 329 yards long, twenty feet wide, and six feet deep, formed of massy sheets of cast iron cemented and riveted together, having, on its southern side, an iron platform for the horse or towing path. It will be necessary to observe, that every aqueduct ought to be provided with stop-gates at the most convenient parts of its length, as well as syphons or other means to drain off the water if required, for repairs or accidents. The stop-gates will be necessary to effect this purpose, and provision should be made for their erection in the first beginning of the work. They are most usually placed at the approaches or wings of the aqueduct.

Tunnels, or subterraneous passages, are now become familiar, as a means of conveying canals through ridges of high ground and mountains; they are also formed as roads through hills and under the beds of great rivers, to keep up easy communications between parts otherwise inaccessible, except by circuitous routes. Perforations for this purpose were not unknown to the ancients, for we find the Romans frequently making them in order to carry forward their aqueducts. For this purpose they were not required on a large scale, but, although small, they gave rise to the practicability which, to the ingenious, was a sufficient stimulus to create the means of performing greater undertakings; and which has now been acquired and effected through the multiplied local impediments which have presented themselves to inland navigation. The first subterraneous canal or tunnel ever made for the navigation of boats, was at Beziers, on the Languedoc Canal in France; and it is believed the first in England was at Worsley, by the late duke of Bridgewater, but this was to establish a communication to his coal mines only. However, there are now almost as many tunnels as there are canals, and the business of making them is so well understood, that they are set about with as few preliminaries as the deep cutting of a canal.

Previously to beginning a tunnel, the hill through which it is to be formed should be bored in several parts, to ascertain the nature of the soil to be excavated. This being well ascertained, the needful tools and machinery can be collected, that the work may proceed without delays. In setting out a tunnel, it is necessary to observe, that it must be quite straight from one end to the other. It tracing the line of it over the surface of the high ground, a number of small round poles are made use of, their tops painted white, to give them a more obvious direction to the sight: these are set up firmly with braces, at about 150 yards apart, and called, by the navigators, excavators, or miners' bench-marks. When the line of the tunnel is accurately traced out, another row of bench-marks should be fixed parallel and opposite to the first, at a small distance vertically from the greatest diameter of the tunnel. These bench-marks will be the places where the shafts or pits are to be sunk, for the purpose of assisting the excavators or miners, and also of allowing the soil to be raised through. In sinking the shafts, which should be at least seven feet in diameter, and as deep perpendicularly as the lowermost line of the bottom of the tunnel, a kirb should be made of wood, consisting of two circular ribs, and placed four or five feet from each other, and boarded over. With this kirb the shafts can be sunk to any proposed depth, without danger of the ground giving way; and the steining of the sides of the shafts with brick-work may or may not be had recourse to, in proportion to the strength of the soil, which, if good, may be supported by braces and planks only. If the places of the shafts are all marked out at the time of the tracing of the tunnel line, and sunk a small distance into the surface of the hill, they will, in the event of the bench-marks being broken down, remain as guides to the excavators.

After the work has arrived so far, and every other needful arrangement is made, in collecting machinery or removing the soil, the work should be begun by cutting down the headings on each side of the hill intended to be perforated; which should be excavated, and the soil removed, to allow of getting quite up to the approaches of the tunnel. When the approaches are made, the form of the tunnel should be traced on the section of the hill, either by a mould or otherwise. The work having so far proceeded, the perforating is to commence; and this is done by opening a communication from the first or second shaft into the ground in the line of the tunnel, and working opposite to it right and left. Preparation should now be made at the top of the shaft for raising up the soil, and this is done in several ways, the most common of which is to station at the top four or more men, standing on a platform raised three or four feet from the ground; these men turn the handle which is at both ends of a roller, and to which a rope is fastened, with a square bucket or buckets appended to each end of it; they are so regulated in size, as that two can move in the shaft or pit at once: the men in working the roller, that is by turning it round, raise one bucket while another descends, and in this manner they keep raising the soil as fast as it is excavated. In some cases, a horse-gin or turn-beam is employed, similar to those used at coal mines. As the tunneling proceeds, the upper ground should be well propped with planks, and every part secured; as the miners advance in the line. abundance of ribs also

should be prepared to turn the arch of the tunnel upon, and moulds and trammels made for the inverted arch forming the bottom.

The section of a tunnel consists in forming an inverted arch at its bottom, composed of masonry or brickwork: this arch is generally the segment of a circle, and is laid on a good bed of puddling. On the two ends of this arch rise the soffit arch of the tunnel, which in figure is commonly a simple catenaria, a parabola, or ellipse, of sufficient elevation to admit of boats riding easily through it. Plate II. fig. 4, is the section of a tunnel: A the inverted arch at bottom; B, B, the foundations of the soffit arch D, D; E the shaft or pit for taking up the soil excavated from the tunnel; F, F, the guard-rails and chock-blocks fixed to the sides of the tunnel to keep off the boats. The dotted line at C is the drain or sough to convey away the percolating waters; G the soil to be rammed in upon the soffit arch. Plate II. fig. 5, is the plan of the inverted arch to a larger scale. This arch is commonly wrought with a trammel rod, which consists, if executed in brickwork, in setting up a vertical piece of wood, to which another piece is adjusted by a centre which allows of an easy motion right and left, and describes the figure of the segment by its motion. A is the trammel rod; B the vertical shaft to which it is fixed. The trammel can be shifted at pleasure, and is an easy contrivance for forming inverted arches. Plate II. fig. 6, is the section of the soffit arch of a tunnel to a larger scale, showing it with its centering. The beam A may be fixed upon the chock-blocks previously worked into the inverted arch, at F, fig. 4. The queens D, D, may be notched into the back of the beam A, or mortised through it and wedged with sliding wedges. The strutts B, B, may be of one and a half or two inch deal, bolted with nuts and screws to the ribs G, G, and to the queens D, D. The same bolt which fastens the strutts to the ribs, may be made also to fasten the lap-joints in the ribs; the straining beam O may be in two thicknesses put on to each side of the ribs and heads of the queens, with a shoulder to the latter, and one bolt in each will suffice to fasten the whole. The meeting of the centre or rib, at the apex E, should be lapped and bolted with a nut and screw. This may be braced if required. The void F will be found useful to the workmen, in allowing them an easy access into the tunnel to notice the state of the work, and also to see if any settlement is taking place in the centering, &c., which if found weak, cross-braces may easily be fixed in it.

It is not common to make a horse-path in a tunnel, and this is one of the greatest inconveniences attending on boats passing through them, as the bargemen are obliged to scramble through as they can, by placing their hands against the walls, and pushing on their boat in any way. It would be perfectly easy to remove this inconvenience, by making the diameter of the tunnel somewhat larger, and working into the walls, one foot above the top water line, or if it were below that line it would not much signify, a number of iron brackets, projecting from the brick-work about three feet; on these brackets could be laid cast iron plates sufficiently strong to admit of horses passing over them. On the edge of this platform should be a small cast-iron rail; or there could be uprights at all the brackets, with a perforation in their tops, to admit of a rope or chain passing through them, which would act as a guard-chain or rope to the horse-path. The tops of the iron plates might be covered with a strong soil and gravel for the horses to walk upon, and thus would be removed one of the greatest defects in the navigation of a tunnel.

The centering ribs should be made in three or more parts, and they should be so adjusted together, that on the parts approaching one another they should produce the required arch, when they may be fixed with nuts and screws, taking care that the meetings be tight and close. The lower or inverted arch being turned a small way, the ribs for the soffit arch may be placed, three or four of which will be enough at a time; and these are fixed on a piece of timber called a sleeper, which is fastened at the base of the pit, and upon the chock-blocks; as the ribs are raised and adjusted to their places, their upper edges must be covered with laths to support the bricks of the tunnel arch. When the first yard of the arch is turned, the ground above the brick-work of the part formed must be well rammed and filled up, till it is as sound and firm as possible, and this must afterwards be repeated all through the work. After this is done and finished, more ribs must be placed and lathed, and the arching again begun. The workmen now look at their work with more firmness, as they see and comprehend it more completely: they begin now at each end of the already erected arch, one set of workmen working one way, and one set another, which they continue till another yard be done, which is filled up and rammed as before. It will be sometimes necessary, to avoid the effects of the percolating waters, to make at intervals, or wherever it becomes troublesome, cross-drains or soughs running quite under the tunnel, into which an opening can be made for the water to empty itself, and which may be carried off, or turned into the lower reach of the canal.

After three or more yards of the tunnel are completed, the work should be left to settle and get firm: this will be effected in a week or two, according to the state of the weather and the nature of the soil in which the tunnel has been made. If the above circumstances be at all favorable, a week will be sufficient; the nuts and screws may then be taken out of the ribs, and the first part of the tunnel centering taken down to be fixed in another part, and this may be continued all through the work, which will produce a great saving in ribs, &c. Stiff clays are the best for forming tunnels through, as they require less shoring and other supports than looser soils; in some siliceous and argillaceous soils the expences of shoring sand supporting the ground above, with the danger attending the work afterwards, is of more expense and difficulty, than at once beginning the work by open cutting, which in an instance or two has been obliged to be had recourse to, after many attempts at perforating such soils. The expense of canal tunneling, as well as others, must vary as the earth varies through which it is intended to be

made; in favorable circumstances, pretty accurate estimates might be formed; and as a reference, the following account, taken from Dr. Rees' Cyclopedia, article, Canal of the Tunnel at Blisworth, on the Grand Junction Canal, will suffice, as being one of the latest which has been finished. 'The internal width is sixteen feet and a half, the depth below the water-line to the inverted arch which forms the bottom is seven feet, and the soffit, or crown of the arch, is eleven feet above the same line. The side walls are the segments of circles of twenty feet radius, the top arch one of eight feet radius. The side, or top walls, are seventeen inches in thickness, or two bricks; and the bottom, or inverted arch, thirteen inches in thickness, or one brick and a half; every fifth course of the top arch, and every eleventh of the side walls, is composed of two heading bricks, or wedge-like, one inch thick on the inside, and three at the back; also every fifth and eleventh course as above (but between the courses of heading bricks), composed of bricks laid obliquely across the others, the front and back corners being cut off for that purpose in the making, for more effectually breaking the joints of the work obliged to be done in such short lengths. The mortar that was used was composed of one bushel of Southam lime (blue lias), and three of good sand; six inches under the water-line, on each side of the tunnel, slide-rails, of five inches square, were placed to keep the barges off the walls, and fixed by pieces of oak let into the wall below them, which rails project nine inches from the wall, and have at every nine feet a chock of wood upon the rails for the bargemen to set their pole against for shoving their barges along. It is added, that this tunnel was contracted for at £15 13*s*. per yard running. The soil, principally, through which it was made was a hard blue clay, with two or three thin rocks in it: sufficient headings had been executed several years before at the company's expense. The same contractors were paid 10½*d*. per cubic yard for excavating the deep cutting at one end of the tunnel, and 11*d*. a yard for the other. The expenses of driving the headings were from 36*s*. to 42*s*. 6*d*. per yard running; nineteen shafts, or tunnel pits, some of them sixty feet deep, were sunk for the use of the above tunnel, which cost about 30*s*. per yard in depth, including the steining.' From such data very probable estimates may be calculated, taking into account the different prices of labor and materials where such a work is proposed to be effected. The success attending tunneling having been generally complete for canals, undertakings of the same nature have been proposed for various other improvements in our inland communications. Highgate was fixed upon as one for this purpose, which certainly presented a spot in every way eligible for the undertaking, and from which the public might have derived considerable accommodation. The heading of this tunnel was begun on the Holloway side of Highgate, and extended about 350 yards with about thirty yards of vertical cutting. The whole was marl and strong blue clay, with a compactness that required very little propping; every thing in nature was favorable to the success of this tunnel, and the work went on with adequate effect till the arching commenced. It is too well known, that this arch has now given way, and it is for the engineers concerned in it to say, why.—It could not have failed by reason of the soils in which it was formed, as their compactness rendered their bearing on the arch of little or no importance. The shape of the arch made it capable of supporting ten times what was ever upon it, if the bricks had received adequate attention in their bonding. If it failed for want of sufficient foundation, it is to be regretted: the inverted arch was not adequate for that purpose, as a very slight inspection will demonstrate. And if it fell down for want of support in this quarter, it must have been from the engineers' ignorance of the nature of the pressure in such arches. Arches formed of common bricks, when they are to assume a large diameter, require the utmost attention in their construction. The brick of the common size is too small to make any figure as a voissoir in such arches, as it will not allow of falling into the radii of their curvature; if such arches exist, it is by virtue of the cement more than by reason of the shape of the materials of which they are formed. In the tunnel now making across Hyde-park, for conveying the superfluous water from the neighbourhood of Paddington, the bricks which are to form the arch are moulded into the shape of wedges, and are called joggle-bricks; the form of the joggle-brick is previously determined by drawing its shape from the centre of curvature of the arch, of which it is to form a voissoir, and they may be varied as the figure of the arch is composed of more than one centre of curvature; hence the parabolic arch will require joggle-bricks of one pattern for the top, and of another for the sides, such arch being composed of different segments.

Bridges have continued to be erected through every succession of time, and are a leading point in developing the progress of science and the arts, as they appear generally well or ill contrived in proportion as they have advanced. Arcuation, within these last fifty years, has received deductions, arising from mathematical investigations, which has ranked it very high among the late discoveries made in science. It has now been shown that the voissoirs of an arch can be given that form, in relation to the whole matter surrounding them, as to produce an equilibrated figure: and this discovery has so far extended itself as to supply the principle by a table, formed by Dr. Hutton, which sets forth its quantities to every species or degree of curvature. The bridges, to which the attention of engineers, however, is commonly called, are simple buildings, applied to the purposes of a canal; they consist, most frequently, of wood, and their beauty consists in making them light, but adequately strong.

Of the different species of canal bridges the draw-bridge is the most common; it consists of the following particulars: plate I., fig. 9, is the plan of a drawing-bridge; D the canal to be passed. The foundations, right and left of the canal, are supplied either by brick-walls, built battering, or by a row of four or more piles of oak, forced down into the embankment, with a

broad oak-rail on their tops, splayed away to receive the two end-rails of the platform of the bridge. B, B, the embankments to the bridge. G the platform of the bridge. E the vertical posts, fixed on the bank of the canal, a little behind the hinges of the bridge; on the top of these posts are two long tapering pieces F, called the balance-beams, which turn up by means of hinges near their middle, the small ends being connected with the platform of the bridge by means of chains at their further end, and which the heavy ends of the balance-beams are made to counterpoise. When such a bridge is required to be raised for a boat to pass it, it is necessary to take hold of the chains appended to the large ends of the balance-beams, which, being only just counterpoised, are easily pulled up, and when raised, the chains are hooked to the upright posts, to prevent accidents, and the bridge remains suspended.

Bridges, called swivel-bridges, are sometimes made use of on canals; they are much more expensive, and may be easily put out of order by the want of attention in using them; they consist of a platform of wood covered with planks, which is made about half as long again as is required for the bridge: one end of the platform is made light and the other heavy, for the purpose of counterpoise, and the additional weight to the heavy end is produced by means of stowing large stones or pigs of iron at it, so that the bridge, when in its place, or at rest, may attain an equilibrium. At a point of about one-fifth of its length from the heavy end, a round plate is fixed, with an iron axis or pin standing up to enter a hole in the platform, which is prepared to receive it; and on this pin the bridge is suspended, and which is also its centre of motion; and, in order to prevent impediments in turning the bridge round, a number of iron balls, two inches and a half or three inches in diameter, are let into the round plate, both above and below, to act as rollers to lessen the friction on the plates. The banks are formed with a kind of recess to receive the bridge when moved from across the canal. The two ends of the platform, in order to allow of this horizontal motion, are struck into two arcs, the centres of which are the axis or pin in the centre of the friction-plates. At Brussels, and in other parts of Flanders, they have a kind of drawing-bridges composed wholly of iron: they are made somewhat similar to our drawing-bridges, except that they are raised by a cast-iron wheel with cogs; this wheel is about three feet in diameter, and is firmly fixed in the bank, and, by being turned by a handle, raises the platform. It takes up much less room than our drawing or swivel-bridges, and answers every purpose. There are nine or ten to be seen at Brussels, constantly in motion, as ships or craft are passing up the canal. Some of these iron bridges are cut in two in the centre, with wheels in each bank, so that by working the wheels a few degrees a ship may pass the canal, by its masts entering through the space left by raising the two platforms. This kind of bridges are made necessary from the great width of the canals in comparison of ours. The occupation bridge, at Rotterdam, is of this last description, and consists of two separate segments, each supported independently; and, when up for the craft to pass, a void is made between the meetings of the segments by which the masts enter. The convenience of such bridges is obvious, as the towing can go on without removing the line; foot passengers also can pass by the bridge while in motion, as the opening between the meetings is never so wide but a person may step over it. The canals in Flanders, Holland, and every part of France abound in ingenious light bridges: their drawing-bridges are on a scale the engineers of this country have not an idea: there are some over streams 120 feet wide, moved by wheels with more ease than our little ones of twenty feet are by balance-beams.

The bridges of masonry on canals consist of one arch generally, with the difference only, of making its span as much more than the canal as to admit a towing-path under it. The towing-paths are made commonly on the lower side of the canal. The bridges over the canal at Paddington have towing-paths on both sides, and this, when there is room to do it, is a great convenience; besides adding additional strength to the abutments of the bridge. Guard-rails should be fixed to the wings and approaches of the bridge, and also to the embankments under the bridge, to keep the boats from damaging the works.

Docks, from at first being only a simple contrivance at arsenals for the purpose of building or repairing a single ship, have extended themselves to a magnitude in capacity competent to contain whole fleets. In splendor the docks created in London, and at many of the out-ports, are a monument which excel the famous port Pireus in Greece, or Alexandria in Egypt, as much, or more, than we have excelled the Greeks and Romans in all the facilities to navigation, and the grandeur of our naval architecture. The Greeks and Romans no doubt have far surpassed us in all the elegancies of taste and invention in the fine arts: in these arts they have combined and given form to matter, which could have resulted only from a higher degree of feeling, united to juster notions of nature, than the coldness of our climate and habits can perceive, or hardly give power to copy. But if we are behind in the fine arts, which, as mere copyists, we must be contented to be: in supplying all manner of facilities to commerce (in which we excel all nations, ancient and modern), in erecting the immense docks and warehouses inland, which we have done to receive and house safely the produce of the world, and to an extent adequate for that purpose, we have formed a monument at once of our genius, wealth, and skill, which will be as famous in the page of science as the monuments of Athens and Rome are now in the volume of the arts. A dock consists in the first place of a basin commensurate to its intended purpose. A canal communicates therewith, supplied with an entrance-lock and gates. The building of a dock embraces all the skill applied to buildings in water. The embankments are to be traced out in the same manner as is done for canal lines, by setting up bench-

marks to indicate the plan upon the ground. The whole of the embankments of a dock are supported by walls of masonry or brick-work; and, as the docks for ships require a great draught of water, they must be made in depth adequate to allow of ships of burden riding in them in safety: in consequence of which the depth of the docks must be great in comparison of canals. The London docks are upwards of twenty feet deep. In raising the walls on the sides of such reservoirs (as they may be called), it will be obvious that the greatest care must be taken. The foundations of walls for works of this nature should be formed of double or even treble rows of piles; and the inside row, which runs parallel to the embankment, should be grooved on their opposite sides, and be forced into the ground as close together as possible; and, after being so driven, stiles of yellow fir wrought should be driven down into the groove made in each pile, so that the whole inside piling may form a continued chain throughout its whole extent. The planking to form the platform for the wall, should be all scorched previously to being laid upon the heads of the piling, and the joints or meetings of the planking should be crossed or dove-tailed together. If the walls be to be built of bricks, care should be taken to have them of the best quality, and as square and even as can be; and, in order to strengthen their bond in the wall, tiers of Dundee granite should occasionally be incorporated. The walls themselves should be for a height of twenty feet, of fifteen bricks in thickness at the bottom, on planking racking-back on the side next the earth embankment, and battering on the inside of the dock, with tiers of bond of Dundee granite at every twentieth course throughout the height. The slope of the wall should be in proportion to a scale before recited for lock-walls of canals; and a curvature or swell should be formed in the inside section of the wall in the proportion of two inches to every six feet: the walls should, finally, finish at their tops to four bricks in thickness, and the whole be crowned by blocks of Dundee or other granite, as a coping. The mortar used for these kinds of works ought to be particularly looked after, in order to its being of good quality, or very little solidity will result to the work. The ground stone lime with washed siliceous earth, the former as fresh as possible, is the most likely to prove a good cement. The Roman cement, or Parker's, is of great utility in some parts of dock-works. The docks, as Helvoetsluys, are formed with clinkers cemented by Dutch tarras: it has tiers of bond traversing at every four feet, vertically, composed of black marble neatly wrought, which in every other stone goes quite through the wall, and the top of the wall is coped with large slabs of the same marble. The work of these docks from the smallness of the bricks (about six inches long, three in width, and one and a half inch in thickness), and the joint having very little cement in it, makes the whole appear uncommonly neat, and which is not less solid. These docks are, about eighteen feet perpendicular in depth, the side slopes from their base five feet eight inches. The opposite end to the canal of communication is formed into a bow or crescent. The walls all round this dock have a slight swell or curvature in their height. The canal leading to a dock generally branches out of its side, and is walled in a similar manner to the dock itself, and at its upper end or head is contracted by the walls being bent into a circular shape till they meet or intersect the wing walls of the lower end of the chamber of the lock. The lock is the pound or chamber through which the ship or ships enter from the sea or river to which the dock is contiguous: to docks of consequence the locks are made from thirty to forty feet wide, about eighteen feet deep, and 150 feet long. They have gates at both ends, which require the utmost skill in contriving them for tidal-rivers. The bottom of the lock is formed by an inverted arch of masonry in a similar manner to that of canal-locks, except on a larger scale, and of course of a more ponderous nature. The walls are raised battering similar to those of the docks, and, finally, coped at their tops, weirs, syphons, waste-gates, and culverts, are all of use to dock-work, and must be called in as the nature of the situation requires them Wherever it is intended to form docks a large site of ground should be selected, in order to admit of abundance of room for all kinds of stowage and warehouses being built thereon; for without abundance of room very little accommodation can be expected by creating docks on such sites. The necessity of room in such concerns will more obviously appear by considering the space occupied by the docks themselves in the three great concerns now effected in London. See Docks.

After docks, there is another appendage equally flowing from our great maritime power, and which consists in creating artificial piers or break-waters, projecting into the sea for the purpose of giving security to vessels at anchor against the violence of winds and currents, at such places where it has been deemed eligible to form ports or places for ships to anchor at. The late Mr. Smeaton was the first engineer amongst us who embraced, in the boldness of his genius, the requisite science for such undertakings, which has had the effect of establishing his reputation beyond the chance of a failure. Every part of the country exhibits something of his contrivance, either in canals, bridges, harbours, or machinery; and, of course, every thing from such authority is of importance, inasmuch as it may teach those who have now to follow him how true fame may be acquired and become imperishable.

It is extremely difficult to give precise ideas for buildings connected with sea-ports and their harbours; for in such places the natural vicissitudes are what offer the impediments, and they must be met, in the various ways in which they present themselves, by the skill and enterprise of him to whom such buildings may be confided. There have been piers or break-waters erected at many of our ports extending an immense distance out into the sea; for instance, at Sheerness, Ramsgate, &c.: and there have been also several on the opposite coast; the one at Cherbourg is pre-eminent, for boldness and genius. See Cherbourg. Some account of Mr. Bentham's plan, adopted at Sheerness Pier,

will be seen under the head of Buildings in Water, in our article Masonry. The great national work in Plymouth Sound is perhaps on a scale far beyond any thing of the kind ever set about in the world before. We have happily to record its completion. See our article Plymouth.

The erection of beacons and light-houses is a branch of the royal prerogative. The king has the exclusive power, by commission under his great seal. He can order them to be erected, not only upon the royal demesnes, but upon the lands of the subject; which power of the crown is usually vested, by letters patent, in the office of the lord high admiral. And if the owners of the land, or any other person, shall destroy them or take them down, he shall forfeit and pay £100, and in case of inability to pay it, be ipso facto outlawed. By statute, 8 Eliz. c. 13, the corporation of the Trinity House were empowered to set up any beacons or sea-marks wherever they might think them necessary, and in them now almost the whole business, respecting the management of beacons, light-houses, &c., is vested. The beacon is a simple contrivance, of very early origin, as we find frequent mention made of such objects, not only in the Scriptures, but in ancient history, and particularly in the early part of our own. Beacons consisted chiefly in erecting on high places marks whereon were fixed barrels containing pitch or other combustible matter, which, by night operated as a warning, by being lighted, and by day they gave notice of the approach of an enemy, by the volumes of smoke emitted. By the discovery of gunpowder, such expedients have been discontinued; as rockets and other contrivances are found to answer the purpose infinitely better. A light-house is a different kind of building to a beacon, inasmuch as it requires greater constructive excellence in the erection. Its use is chiefly to warn mariners, when navigating in the night, from approaching too near certain parts of the coast known as dangerous, either by rocks, shoals, or currents; and it is also a land-mark by day. These structures are of great national importance, and, as such, cannot receive too much attention, either in forming them in the most substantial manner, or supplying them with the best lights. A light-house, as now erected, consists of an upright shaft of masonry or brick-work, built hollow in the inside, in which are winding stairs leading to its summit. The top is generally surmounted by a cornice of stone, with a space left sufficiently large to admit a single person safely to walk round upon it. On the top of the whole fabric is erected a lantern, often from twelve to fourteen feet high, and six or seven feet in diameter, in the inside of which is a frame, to which are suspended, in various angles, and in as many elevations, a number of lamps and reflectors; the lamps vary from ten to as many as fifteen in some light-houses. Such a body of light and that reflected with the greatest power on an immense height, as they most frequently are, creates a surprising effect, which is discovered at sea by mariners when many leagues off, and which enables them to shape their course accordingly.

The Eddystone light-house was erected by the late Mr. Smeaton, and in this is employed, perhaps, more ability than in any similar structure in existence, arising out of the difficulty of erecting any thing in such a perilous situation. Mr. Winstanley began a light-house on the Eddystone rock in 1696, which he was four years in finishing, which was formed wholly of wood. The following notices respecting his operations may not be unacceptable. The first summer was spent by Mr. Winstanley and his people in making twelve large holes in the rock, and fastening as many irons, to hold the future work. In the course of the next summer, a solid body or round pillar, twelve feet high, and fourteen feet in diameter was completed. In the third year it was increased to sixteen feet in diameter from the foundation, and the whole building was raised, which was eighty feet to the vane. In the fourth year, the diameter of the pillar was encompassed in a new work, four feet in thickness, and the building raised forty feet higher when the light was exhibited. This building was formed almost wholly of timber, and it did not meet with any accident till 1703, when standing in need of repair, Mr. Winstanley came to see it; and having been among his friends previously to going off with his workmen, to view the repairs, the danger was intimated to him, and that one day or other the light-house would certainly be overset: he replied, 'He was so well assured of the strength of his building, he should only wish to be there in the greatest storm that ever blew under the face of the heavens, that he might see what effect it would have on the structure.' Mr. Winstanley was but too amply gratified in his wish; for while he was there with his workmen, that dreadful storm began, which raged the most violently upon the 26th of November, 1703, in the night; and of all the accounts of the kind with which history furnishes us, we have none that exceeded this in Great Britain, or was more injurious or extensive in its devastion. The next morning, November 27, when the violence of the storm had in some measure subsided, so that it could be seen whether the light-house had suffered by it, nothing appeared standing, but, upon a nearer inspection, some of the large irons whereby the works were fixed upon the rock; nor were any of the people, or any of the materials, ever heard of afterwards.

The next light-house, built on the Eddystone, was by Mr. Rudyerd: it was finished in 1709, and destroyed by fire in 1755. It was now deemed eligible to erect a superior building, if possible, and one not so likely to meet its destruction, either by the violence of the sea, or the effect of fire, as both the former had been destroyed by one or the other. Mr. Smeaton was employed, and, contrary to the received and popular opinion, that no building could be made to stand except one formed of wood, he showed a contrary design, and boldly projected a lighthouse of stone. He himself says, 'he shall endeavour so to form it and put it together, that, by a similarity of construction, no man shall be able to tell him at what joint it should overset; for if at any given height the

uppermost course was then completed safe, it became more safe by another course being laid upon it; and though that upper course were somewhat less in weight, and in the total cohesion of its parts, than the former, yet every course, from the first foundation, was less and less subject to the heavy stroke of the sea.' This building was formed to resist the effect of both wind and water, and these acting on it occasionally in a most tremendous way. The light-house is wholly of cut-masonry, about sixteen feet in diameter at bottom, and diminishing upwards conically; it is seventy-three feet six inches in height, measuring from the rock on which it stands to the top of the cornice. Mr. Smeaton chose a curve for this structure with its concavity turned outwards, and the judiciousness of such a choice is now fully established. From the top of the cornice to the base of the lantern is seven feet six inches, and from thence to the summit of the ball seventeen feet six inches, which, together, make a total height for this structure of ninety-eight feet six inches. See also Bell Rock Light-house.

The form of such buildings has involved considerable intricacy of mathematical investigation. M. La Grange has calculated that a cylinder is the strongest form for resisting flexure, which is contrary to the known fact, and could be only deduced from the intricacy of the investigation. If it were calculated what would be the best form for a wooden column, which to a certain depth was always to remain exposed to the water, it would be found that a cone or pyramid would possess the greatest possible strength for supporting the pressure of the water; and for resisting the wind also, the figure must be made more acute than it would otherwise be necessary for resisting the water only. The Plymouth break-water has justly been considered as one of the finest pieces of hydraulic engineering in existence. It is about one thousand seven hundred yards in length, and the principle on which it is made to resist the operation of the waves is shown in our plate Break-water, fig. 3. It consists of an inclined plane, formed of loose stones thrown promiscuously from the flat-bottomed vessel fig. 1. A large block of about ten tons is there shown in the act of being discharged from the platform. An enlarged view of the carriage and platform is given at fig. 2.

The forming of roads is of considerable importance to every well regulated country; and although it has been, perhaps, too much neglected in our own, it is now receiving that attention which its importance requires. We shall devote to the important subject of high roads, a separate article, embracing the latest improvements. See Roads.

The origin of iron or rail-roads may be traced back to the year 1680. About that period coal came to be substituted for wood as fuel in London and other places: the consequence was, that at the mines the greatest inconvenience accrued in conveying the coal from them to the ships, as well as immense expense in horses and machinery for the purpose; to remove which, waggon roads were made, consisting of wooden rails or ledges, which the waggons were formed to move upon, from which improvement it was found that a single horse could easily draw a waggon on these rails, which previously required three or more horses to be employed to effect by the common roads; and it was also drawn more quickly, arising fromlaying down the frames upon an easy descent, which was always done.

In 1738 this invention was farther improved by substituting cast-iron rails instead of the old wooden ones; but owing to the old fashioned waggons continuing to be employed, which were of too much weight for the cast-iron, they did not completely succeed in this first attempt. However, about the year 1768, a simple contrivance was attempted, which was to make a number of smaller waggons and link them together; and, by thus diffusing the weight of one large waggon into many, the principal cause of the failure in the first instance was removed, because the weight was more divided upon the iron. In 1797 these roads having impressed the minds of intelligent men as of great importance, numerous essays appeared, setting forth their utility, and as many plans for rendering them of permanent construction. See Dr. Anderson's Recreations, Nicholson's Journal, Repertory, &c. &c. Hence cast-iron rail-roads became a second desideratum to canals, excepting only that the invention is due to Englishmen. After this time the cast-iron rail-ways began to be constructed as branches to canals, and in some places as roads of traffic from one place to another, established upon permanent principles, so as to produce a permanent revenue to the undertakers. In surveying a line to set out a rail-way upon it will be necessary, as a preliminary step, to ascertain, as accurately as the nature of the thing admits, the quantity of lading expected to traverse each way upon its line; because in forming the slope or descent, this will be the datum on which to ground a medium for effecting the required purpose most easily. If it should turn out that as much lading is expected one way as the other, with a preponderance at periods only, the railing must in such a case be set out in levels or in lines nearly level, and the ascents and descents made by planes inclined accordingly. Previously to beginning any part of the work, that is of laying the sleepers, &c., for the iron-rails, a rough sketch or section of all the different routes intended to be passed by the rail-way should be made; from which, and a view of the ground, the engineer will be enabled to determine the place, and also the extent of the inclined planes which will be required in passing the steeper parts or the rising ground to which these planes are to be employed: it will always be desirable to get them as short as the site of the place will admit. In tracing out the line of a rail-road, the following method is pursued by our best engineers: they begin at the highest point, using a chain (of 100 links), and also berms, or bench-marks, and targets, as they are called. The chain is stretched out upon the ground, one end being held at the point of the deepest turn, and the other turned round upon the face of the descent, until a point

marked by this end is found, which is one link lower than the upper end, or nearly so. The chain is still carried forwards till its hinder end reaches the point last determined. The other end is then moved, and another point is ascertained one link lower than the last, and the operation is so continued, by which a line having the regular descent of one link to each chain will be traced out on the site of the intended rail-road. The bench-marks are to be put in at each successive observation to mark the place found, and if it turn out irregular and crooked, the operation must be again repeated till the line appear more regular and without any sudden bends or crooks which must be always removed and made undulating and easy, as it will prevent unnecessary friction in the wheels of the carriages against the ribs of the rails. The rail-road when first marked out has a stake or mark set up at every chain in length, and these marks are the guides by which the workmen begin the operation of putting down the roads. When sudden valleys present themselves, approaching to higher ground, it will be necessary so to conduct the line as to cut into the hill at each side, and the cutting from the latter will be useful in raising the road-way of the former. On approaching rivers or brooks which it is determined to pass, it will be necessary to keep up the rail-road to a higher level by embankments, and on passing the water to raise a platform on purpose for it, composed of piers of masonry or columns of iron, with a covering of iron also to receive the rails; or a bridge, similar to an aqueduct bridge, will answer the purpose. Rail-ways may be divided into single and double: by the former it is understood that a single road only is to be formed; by the latter, that two or more are to be made for the ready passage of waggons up and down the road. Single roads are generally made, including horse and attendant paths, four yards wide; and double ones vary from six to eight yards wide, exclusive of all the common appendages to such roads of drains, fences, &c. &c. In forming permanent rail-ways stone-sleepers are necessary. These consist of pieces of good sound free-stone, with their upper faces wrought fair, and should weigh from 150 to 200lbs. each, with their ends, which come together wrought smooth, so that the joints may be firm and close. The work of setting the sleepers must commence as soon as the road has received a tolerable surface in point of regularity. In cases in which there has been much making up or embanking the ground, short piles (as shown plate 2, fig 7, B, B,) should be driven down to receive the stone sleepers, taking care to let the head of the pile come exactly under each meeting or joint of the stone-sleeper.

In commencing the work of laying down the stones, great exactness will be necessary in order to the iron-rails lying firmly on them; when one of the stone-sleepers is laid in the proper place for one side of the rail-way, and nicely bedded and rammed down, another is to be laid at four feet distance from it, and bedded in a similar way. When these two stones are laid, they will operate as guides for proceeding in laying more stones, right and left, which should be carried forward together. A,A, plate II. fig. 7 represent the stone-sleepers: B,B, the piles or blocks for supporting the sleepers in infirm ground; C,C, the sections for the cast-iron rails. Every tram or rail-road must be provided with passing places; a passing place consists in forming large plates of cast-iron, in such a manner as to admit of common rails being joined to them, and which will allow the waggons traversing the road to pass off into another or adjoining tract. Plate II. fig. 8, shows a passing place for a double rail-road drawn to a quick sweep: but the turning or passing place need not be of such acuteness in general, but may follow a more obtuse shape, as best suits the nature of the place to be passed. Plate II, fig. 8; represents the plan of the two meeting cast-iron plates, D, D; these plates should be accurately modelled in wood for the founder; and they should be so adjusted as that one model may serve for as many passing places as possible on the line of the proposed road; F, F, shows the joints where the common rails meet the passing ones; E, E, are moveable iron tongues placed in the centre of the passing plate, D D; which allow, by turning them round on a centre, of being removed to either side of the plate to keep the wheels of the waggons in the tract required; so that a waggon may go on either side of the road by putting the tongue in the opposite direction. The side rails are shown at G, G; these consist of common side rails, except only that they must be modelled and founded to the intended shape of the passing place. H H shows the horse-path of the rail-road at the passing place. Plate II. fig. 9, exhibits a single length of a common rail for a road, with its projecting margin, K, to keep the waggon wheels in the tract; as also the grooves, I, I, through the ends or meetings to allow of their being fastened to the stone sleepers. The common method of fastening the cast-iron rails to the stone-sleepers, consists in previously making in the stone an octangular perforation opposite to every joint intended in the cast-iron rails, into which a trunnion of good sound oak is fitted, with the grain of the wood presenting its section uppermost. The perforations to receive the oaken trunnions should be made quite through the stone, in order to prevent the effects of the frost, which, if not through, the water lying in the hole will become frozen, expand, and shiver the stone into pieces. When the iron rails are nicely arranged upon the bearers or sleepers, they are to be fixed down by driving an iron key pointed at its lower end, so as to allow of its being driven into the oaken trunnion; the iron key has a head projecting similar to the letter T: and its lower shaft is made exactly in size to fill the void or groove left in the ends of the iron rails, as shown at I, I, fig. 9. The common cast-iron rails for roads are formed in lengths of about three feet each; they are made about four inches wide upon the flat, or that part intended for the wheel of the waggon to move upon, and which is about one inch in thickness, sloped off a little to the horse-tract: the projecting rim rises two inches and a half from the flat or bottom of the rail; in its centre forming the segment of a circle projecting

upwards about an inch only at its meetings (See fig. 9). The cast-iron plates at the passing places should be made somewhat stronger than the common rails, as at the passing places there is the greatest wear and tear upon the whole line. The iron moveable tongues E, E, fig. 8, should be of wrought iron, and made about two feet six inches or three feet long, standing up upon the plate equal in projection to the highest part of the rim, K, of the common rails. It should be on a good strong axis or pin, that it may be strong and yet allow of being easily turned round, which it will require to be every time the waggons are passing by the different tracks up and down the rail-way. In passing deep descents, pieces of cast or wrought iron must be provided, called sledges or slippers; these are provided to be placed under the wheels of the waggons, to prevent their too rapid descent, and are similar in principle to the same kind of instrument made use of, and appended to our road-waggons, for putting under the wheels on their going down a hill. When the whole iron rail-way is fixed, and levelled to the satisfaction of the engineer, it will be necessary to begin to prepare the horse and attendant paths; the foundation of the former should be, if possible, composed of good lime-stone, broken into small fragments, and strewed to the consistence of at least from ten to fourteen inches in thickness, rather convex towards the centre of the path, upon this large screenings of gravel should be laid: the attendant path should be firm and regular, with a gravelly surface. The horse-tract and rails ought to be always kept clear and free from soil, which is constantly collecting on rail-roads of great traffic; and they ought also to be properly drained and kept dry at all seasons of the year; as on this, in a great measure, will depend their substantiality, and of course their utility.

With respect to the waggons employed on iron rail-roads, those in most general use are so constructed, that their weight, including their lading, does not exceed three tons and a quarter. This is found by experience to be the most eligible size: as the rail-roads retain their shape without much dilapidation, by the use of waggons equal to such weight. The wheels of the waggons are made of cast iron, two feet five inches high, having twelve spokes, which increase in width as they approach the hub, or centre of the wheel. The hub is eight inches long, and receives an axle of wrought iron. the rims of the wheels are two inches broad. The axles of the wheels are fixed at two feet seven inches distance from each other; the bodies of these waggons are seven feet nine inches long, four feet five inches wide, and two feet four inches deep; and this sized waggon is calculated to contain the quantity of coal, or other matter, equivalent, with the waggon added to it, to make a weight altogether amounting to three tons and a quarter, as before stated, as the most eligible weight to move upon a cast-iron rail-road. In the Philosophical Magazine, July, 1811, are the following remarks concerning waggons, and also rail-roads, from which some idea may be formed of the utility of such roads. The waggons on our cast-iron rail-roads, have not received the improvements of which they are capable; but, with their present disadvantages, the following facts will evince the great saving of animal force to which rail-ways have given rise: First, with a declivity of one inch and a quarter per yard, one horse takes downwards three waggons, each containing two tons: second, in another place, with a rise of one inch and six-tenths per yard, one horse takes two tons upwards. Third, with eight feet rise in sixty-six yards, which is nearly one-fourth of an inch per yard, one horse takes two tons upwards. Fourth, on the Penrhyn railway (same slope as above), two horses draw downwards four waggons, containing one ton of slate each. Fifth, with a slope of fifty-five feet per mile, one horse takes from twelve to fifteen tons downwards, and four tons upwards, and all the empty waggons. Sixth, at Ayr, one horse draws on a level, five waggons, each containing one ton of coal. Seventh, on the Surrey rail-way, one horse, on a declivity of one inch in ten feet, is said to draw thirty quarters of wheat. From these cases, and the known laws of mechanics, we may, perhaps, safely infer, that where the apparatus is tolerably good, and well constructed, and the slope ten feet per mile, two horses may draw five tons upwards, and seven tons downwards.

In cases in which inclined planes are to be had recourse to, to carry the rail-road over high grounds (and there are several now passing such ridges), the mode pursued in raising the waggons may not be unacceptable. The common plan is by a perpetual chain suspended at each end: it is so contrived, that the waggons disengage themselves the moment they arrive at the upper or lower extremity of the inclined plane. In some cases, the laden waggons descending, serve as a power to bring up the empty ones; but where there is an ascending as well as a descending traffic on the rail-way, steam-engines, water-wheels, or other machinery, to answer the same purpose, are used. 'At Chapel le Frith, there is an inclined plane of 550 yards. On the proposed rail from Glasgow to Berwick several inclined planes will be required, the summit of that rail-way being 753 feet above the level end of Berwick quay.' As to the expense of rail-ways, they are inconsiderable, in comparison of canals. According to Mr. Fulton, 'the cost of a single rail-road, with sufficient crossing places for a descending trade, was estimated at £1,600 per mile.' In Dr. Anderson's recreations, £1,000 is mentioned as the estimate for a double one. However, Mr. Fulton's is most likely to be the nearest to accuracy, as his calculations were made from actual observation, and embraced the whole minutiæ of such a work.

The principal rail-ways in England and Wales are the Liverpool and Manchester, thirty miles in length, which is just completed; the Cardiff and Merthyn, twenty-six miles and three-quarters long and runs near the Glamorganshire canal; the Caermarthen; the Sexhowry, twenty-eight miles, in the counties of Monmouth and Brecknock; the Surrey, twenty-six miles; besides several in the north of England.

**ENGIRD'**, *v. a.* En and gird. To engird; encircle; surround.

> My heart is drowned with grief,
> My body round *engirt* with misery;
> For what's more miserable than discontent?
> *Shakspeare.*

**ENGIRT'**, *v. a.* En and girt. To encircle; environ; engird.

> That gold must round *engirt* these brows of mine.
> *Shakspeare.*
>
> So white a friend *engirts* so white a foe. *Id.*

# ENGLAND

ENGLAND, Lat. Anglia, the southern and most important division of the island of Great Britain, is of a triangular form; and from the south Foreland in Kent, which is the eastern point of the triangle, to Berwick-on-Tweed, which is the northern, its length is 345 miles; from that point to the Land's End in Cornwall, which is the western point of the triangle, it is 425; and the breadth thence to the south Foreland is 340 miles. Its superficial extent is estimated at upwards of 50,000 square miles, or above 32,000,000 of statute acres. England is bounded on the north by Scotland, north-east and east by the German Ocean, south by the English Channel, and west by St. George's Channel, the principality of Wales, and the Irish Sea.

England contains forty counties, twenty-four cities, 160 boroughs, two universities, and eight cinque-ports. Wales has twelve counties and fourteen boroughs. The counties return 158 knights; the cities fifty citizens; the boroughs 335 burgesses; the universities four representatives; and the cinque-ports eight barons to parliament. The circuits of the judges, six in number, are called, the Home circuit, the Norfolk, the Oxford, the Midland, the Western, and the Northern circuits. Middlesex, Chester, and the Isle of Ely, were not included in these circuits. The two grand ecclesiastical divisions, or provinces, are those of the archbishoprics of Canterbury and York.

We should not here perhaps pass over, without some notice, the circumstance of several of the counties having certain portions detached, and surrounded by districts belonging to other counties. This is the case in the following instances: Shilford, which is a political and statistical part of Berkshire, is actually in Oxfordshire; as also is Langford, belonging to the same county; and on the south-western borders of Berks, this county and a portion of Wiltshire are intermixed, near Titcombe and Oxenwood. Northamptonshire on the southern border contains a portion of Buckinghamshire: and Caversfield, in this latter county, is involved in Oxfordshire. The southern and south-western districts of Gloucestershire are so intermixed with the north-eastern portions of Somersetshire as often to create considerable difficulty in discriminating them; while Holwell, which belongs to Somersetshire, is some distance in the county of Dorset. Gloucestershire has likewise a portion situate in Wiltshire; this is the case with respect to Myntey. Cascob, encompassed by parts of the county of Radnor, the Futhog Hills in Monmouthshire, and Farlow and the Clee Hills in Shropshire, all belong to the county of Hereford. Coleshill Green, belonging to Herts, is surrounded by parts of Buckinghamshire. Everton, belonging to Huntingdonshire, is actually in Bedfordshire. The parish of Lillingstone Lovell, in Oxfordshire, lies within the county of Northampton; as also does Boycot, likewise a part of Oxon. The reader, in casting his eye over the map of Shropshire, will also be struck with the singular appearance of Hales Owen and the Leasowes being in Staffordshire, together with the hamlet of Oldbury, belonging to the parish of Bridgenorth in the hundred of Stoddesden. Staffordshire also appears to have taken a portion of Worcestershire; while this county engrosses a portion of its neighbouring province Warwickshire; and Warwickshire again contains part of Worcestershire. Part of Wiltshire is in Berks. Lastly, the county of Worcester seems singularly insulated by a portion of Gloucestershire; and parts of Herefordshire are encompassed by the western boundaries of Worcestershire. The Isle of Thanet it is well known is a part of the county of Kent.

The reader is referred to our article Britain, for the general statistics of the island and its political history to the period of the final settlement of its Saxon conquerors here, under Egbert. We now resume the statistics and the history of England, distinctly considered, until the latter merges in that of Great Britain under king James I.

## PART I.

### STATISTICS OF ENGLAND.

England, in its general appearance, as in its size, claims the palm of superiority over the rest of our island. It is far more minutely cultivated than either Scotland or Wales. There is no topic on which an Englishman may more proudly exult than the scenery of his native country. If, in particular points of natural grandeur, other countries, and even other parts of Great Britain, may outvie England, she presents a union of the agreeable with the grand and imposing, of the confirmed works and triumphs of art, with the magnificence of nature, no where else to be found. We are not destitute of the lofty mountain, the craggy rock, and the dark moor, as an occasional contrast to scenes more attractive in their individual features. We have also our architectural antiquities, great in ruin, and still greater in the moral and patriotic associations connected with them. But in the gentle undulations of hill and vale, crowned with wood, fertile in corn, or overspread with cattle; in the high cultivation and elegant disposition of our scenery, we are unrivalled. No where is there such a source of scenic beauty in rural and general opuence.

In our article Britain we have noticed the great mountain ranges of England. Of about

seventy forests, mostly planted by the first Norman kings, not more than four remain: Windsor, New Forest, Dean Forest, and Sherwood Forest; and there are now scarcely any woods which do not belong to some nobleman's or gentleman's seat, or are not attached to some of the royal palaces. Neither is the face of the country so much diversified with lakes, meres, or fens, as formerly. The district now most properly designated as the Fens is comprised in the contiguous parts of Northamptonshire, Lincolnshire, Cambridge and Huntingdon, with the northern borders of Norfolk and Suffolk. But the improvements in agriculture, and the practice of drainage in general, have converted numerous extensive portions of fenny and marshy districts into arable land. There are, however, several beautiful and extensive lakes; particularly those of Cumberland, Westmoreland, and Lancashire, which are not exceeded, in extent or picturesque effect, by many others in the known world.

Espriella, speaking of the small but exquisitely beautiful lake called Brotherwater, remarks, 'I have never seen a single spot more beautiful or more rememberable. The mountain behind it—is one of the highest in the country, and forms a cove, in which a single old mansion stands in a green field among old trees. The most rigid Jeronymites could not wish for a place of more total seclusion. Out of this lake flowed a little river, clear, rapid, and melodious; we crossed it, and our path lay along its banks. How often did I stop and look back, and close my eyes to open them again, as if repetition could better impress the landscape upon remembrance than continuity! The delight I felt was mingled with sorrow by a sense of transitoriness;—it was even painful to behold scenes so beautiful, knowing that I should never behold them more.' We must allow this pseudo-traveller, but real poet, to describe another of our lakes: that of Keswick. 'There is something in this place,' says he, 'more like the scenes of enchantment in the books of chivalry than like any thing in our ordinary world,—a building, the exterior of which promised all the conveniences and elegancies of life, surrounded with all ornamental trees, in a little island, the whole of which is one garden, and that in this lovely lake, girt round on every side with these awful mountains. Immediately behind it is the dark long western mountain called Brandelow: the contrast between this and the island, which seemed to be the palace and garden of the Lady of the Lake, produced the same sort of pleasure that a tale of enchantment excites, and we beheld it under circumstances which heightened its wonders, and gave the scene something like the unreality of a dream. It was a bright evening, the sun shining and a few white clouds hanging motionless in the sky. There was not a breath of air stirring,—not a wave, a ripple, or wrinkle on the lake; so that it became like a great mirror, and represented the shores, mountains, sky, and clouds, so vividly that there was not the slightest appearance of water. The great mountain-opening, being reversed in the shadow, became a huge arch, and through that magnificent portal the long vale was seen between mountains, and bounded by mountain beyond mountain: all this in the water, the distance perfect as in the actual scene,—the single houses standing far up in the vale, the smoke from the chimneys,—every thing the same, the shadow and the substances joining at their bases, so that it was impossible to distinguish where the reality ended and the image began. As we stood on the shore, heaven and the clouds and the sun seemed lying under us; we were looking down into a sky, as heavenly and as beautiful as that over head; and the range of mountains, having one line of summit under our feet and another above us, were suspended between two firmaments.'

The most extensive plains of England are, as we have noticed, in the eastern and southern shores of the island. The great centre plain spreads from the banks of the Thames to those of the Humber, and even beyond that river. It therefore includes a great part of Essex, Suffolk, and Norfolk, with the margins of the bordering counties; thus embracing nearly the whole eastern side of England. The Wealds of Kent, Surrey, and Sussex, form another extensive plain, stretching from Ashworth, in the first county, to Petworth in the last; and separating the South Downs, and the northern range of chalk hills in Surrey and Kent. Its length is between sixty and seventy miles, and its surface about 1000 square miles. The wide-spread district, called Salisbury Plain, is an open country, resembling the Sussex Downs.

The principal vales of England, denominated after its greater rivers or towns, and the scenes of its greatest fertility, are, beginning northward, those of Carlisle in Cumberland, encompassing that city; that of Coquet, in Northumberland, through which a river of that name flows, and greatly noted for its agricultural luxuriance. The vale of the Tyne, in the southern part of the same county, richly and beautifully variegated. The vale of Stockton, embracing both banks of the rapid Tees. The vale of York, one of the most extensive and fertile in the kingdom, containing 12,000 square miles of surface, intersecting that county from north-west to south-west, is separated from the vale of Stockton by a narrow district of almost imperceptibly rising ground. It stretches thence to the Humber, and is refreshed by the numerous rivers and streams which are tributary to the northern Ouse. This luxuriant vale abounds in timber, and affords ample returns of agricultural products. A branch watered by the river Derwent, diverges towards the north-east, and separates the Wolds from the eastern Moorlands. The vale of the Mersey includes the margins of Lancashire and Cheshire; while much of the central regions of this last county form that of the Dee. The valley of the Severn is an extensive tract of rich land, commencing near the borders of Wales, and, traversing Monmouthshire, Shropshire, and Gloucestershire, is divided by slight elevations into the district of Worcestershire, and the vales of Gloucester and Evesham. A great proportion is appropriated to pasture.

In the west of England, the most attractive vales are those of Exeter and Taunton: the former, stretching from the Tiverton hills to the sea

is watered by the rivers Exe and Otter; and comprises about 200 square miles: the latter, separated from that of Exeter by a ridge of high land, extends in an opposite direction to the Bristol Channel. Aylesbury stands in a vale, abounding in rich pasturage, and watered by the Thames as it flows through Buckinghamshire. The Trent also has its vales, particularly in that part of the county of Nottingham which borders on Lincolnshire and Leicestershire.

The rivers of England have been enumerated in the article BRITAIN; more particular descriptions of their courses belong to their respective places in the alphabet: and the canals of this country form a large feature in our article INLAND NAVIGATION.

No country is richer, for its size, in mineral waters. Those of Bath, Buxton, Bristol, and Cheltenham, have already fallen under our notice: Harrowgate, Matlock, Scarborough, and Tunbridge Wells complete the catalogue of the principal ones, and will each be found distinctly treated. At Gloucester a chalybeate spring has recently been discovered, more strongly impregnated than either those of Cheltenham or Leamington. We must not omit to notice the aluminous chalybeate water of the S. S. W. of the Isle of Wight. This contains sulphate of iron and sulphate of alumen: there are also some portions of carbonic acid gas, sulphate of lime, sulphate of magnesia, sulphate of soda, muriate of soda, and silicia: but these ingredients are rendered wholly imperceptible to the palate by the superior portions of iron and alumen. These impregnations are much stronger than are to be met with in any other mineral water of England; and even than those of Hertfell-water in Scotland. The sulphureous waters of Gilsland, in Cumberland, consist of muriate of soda, sulphureted hydrogen gas, azotic gas, and carbonic gas. The saline waters of Leamington Priors, in Warwickshire, are also in considerable repute and much frequented. The medicinal springs issuing from the Malvern Hills in the counties of Worcester Gloucester, and Hereford, are of various qualities; but principally chalybeate. They do not contain any uncombined vitriolic acid, volatil alkali, or metallic salt; but are slightly impregnated with fixed air, some common air, selenites, and a little unneutralised calcareous earth.

There is a chalybeate spring at Southampton, at the bottom of Orchard Street, resembling that of Tunbridge Wells. The component parts are steely particles, marine salts, an oily matter, an ochreous substance, a volatile vitriolic spirit, too subtile for analysis, and a simple fluid. The Nottington mineral spring, near Weymouth, contains hepatic, phlogisticated, and fixed air, the digestive salt of Sylvius, vegetable alkali, magnesia, &c., and strongly resembles the Moffat water in Scotland.

Of the ever-varying but healthy *climate* of this country we have observed that July and August are its warmest, and December and January its coldest months. In the former Fahrenheit's thermometer seldom rises above 85° or 86°, the general maximum of the year being 81° or 82°; and in the latter it seldom sinks lower than 14° or 15°, though it has been known to descend below 0°. The thermometer has been long supposed to attain the greatest height a little west of the metropolis; but this, as we shall presently show, is a mistake. The north-eastern counties are subject to a greater degree of cold than those on the north-west. The north and south of England differ less in the temperature of winter than in that of summer. The greatest and least heights of the thermometer, at the following places, have been thus given:—

| | Liverpool. | Middlewich. | Lancaster. | London. | Dover. | Sidmouth. | Derby. |
|---|---|---|---|---|---|---|---|
| Greatest height | 86° | 78° | 82° | 81° | 86° | 76° | 78° |
| Least height | 22 | 21 | 18 | 20 | 16 | 20 | 19 |

The following is another calculation of the mean temperatures of London and York, reckoning the spring to begin with March and end with May, and each of the following seasons to contain three months.

LONDON.

| | |
|---|---|
| Spring | 46·2 |
| Summer | 62 |
| Autumn | 59·4 |
| Winter | 40·5 |
| Annual mean | 51·9 |

YORK.

| | |
|---|---|
| Spring | 42·6 |
| Summer | 63·3 |
| Autumn | 56·3 |
| Winter | 36 |
| Annual mean | 49 |

Dr. Young states the mean temperature of the six winter months, from October to March, inclusive, at London, to be 43·5°; while at Dawlish, on the south coast of Devonshire, it is 45·3°, and at Ilfracombe, on the shore of the Bristol Channel, as high as 59°. From November to March the mean temperature, at London, is 42·6°; at Penzance, in Cornwall, 48·1°. From January to March, at London, 37·9°; at Penzance, 48·5°; and at Sidmouth, in Devonshire, 41·7°. During February and March, in the metropolis, 41·5°; at Clifton, 42·6°. From October to December, in the capital, 47°; and at Sidmouth, 45·7°. In the most sheltered parts of Devonshire the mean winter temperature exceeds that of London by about 1·5°; while, during the coldest months, the temperature at Penzance is, according to this writer, higher than at London by 4·5°.

Mr. Howard, who has directed his particular attention to the climate of London and its neighbourhood, observes, in regard to the law of temperature in such climates as ours, that it is probable the mass of air is similarly affected by the sun's rays, and that the proportion of heat

which it derives from the direct passage of the rays is the same in all seasons. 'The accumulation of heat,' says he, 'near the surface of the earth, which we always experience from continued sunshine, is evidently due to the stoppage of the rays at that surface, and to their multiplied reflexions and refractions, in consequence of which they are as it were absorbed and fixed, for a time, in the soil and in the incumbent atmosphere. By this process the earth, when in a cold state in the end of winter, becomes gradually heated to a certain depth as the warm season advances. On the other hand, when the sun declines, in autumn, the soil thus heated acts as a warm body on the atmosphere, and gives out again the heat it has received.' Howard on the Climate of London, vol. ii. pp. 131, 132. 'Were it not for this effect on the part of the earth,' Mr. Howard continues, 'the heat indicated by the thermometer would probably, on a long average (to obviate the remaining irregularities caused by clouds, rain, wind, and evaporation), be precisely at its maximum and minimum at the solstices, and at the mean at the equinoxes. For the power of the sun is proportionate to the quantity of parallel rays falling on a given area of the earth's surface. And this quantity is greatest when they are vertical, and diminishes as they become more oblique; till in a perfectly horizontal position of the rays it is null.'

It results from these causes, that the maximum and minimum temperatures of our climate, in place of coinciding with the solstices, are removed to a whole month after them; and, in like manner, the mean temperature of the year is developed about a month after either equinox. In consequence of this fact, which is fairly deduced from actual observation, Mr. Howard is led to propose a new division of the seasons, more consonant with the actual phenomena on the earth's surface amid which we live, than the present, which has regard only to the remote causes of temperature, and not to the actual temperature which exists around us. This natural division is effected by 'removing the beginning of the seasons fifteen days from their respective present situations, and placing them at that distance before the equinoxes and solstices.

'By this arrangement, Spring would begin the 6th of March, at the temperature (for London) of 39·94°, would occupy ninety-three days, and end on the 6th of June, at the temperature of 58·08°—the temperature having risen 18·14°. Summer on the 7th of June, and last ninety-three days; during which space the mean temperature (of London) will have risen from 58·08° to 64·75°, or 6·67°, and have declined again 6·59°. Autumn, on the 8th of September, at 58·16°, and have ninety days; during which the mean temperature will have declined 18·35°. Winter, comprehending eighty-nine days (or in leap-years ninety), would begin 7th of December.—During this season the mean diurnal temperature having fallen 5·36 (viz. to 34·45°), would have again risen 5·49°, or to 39·94°, on the 5th of March, the concluding day of the season.'—Vol. ii. p. 130.

We must here notice the singular fact established by Mr. Howard, from comparing his own observations at Plaistow, Stratford, and Tottenham Green, with those recorded in the Philosophical Transactions for thirty years, and which were made at the Royal Society's apartments in London, that the temperature of the air in this metropolis is regularly raised by artificial sources of heat to 2° on the annual mean above that of the immediate vicinity.

Mr. Howard's explanation of this singular difference is the following: 'That the superior temperature of the bodies of men and animals is capable of elevating, in a small proportion, the mean heat of a city or populous tract of country in a temperate latitude, is a proposition which will scarcely be disputed. Whoever has passed his hand over the surface of a glass hive, whether in summer or winter, will have perceived how much the little bodies of the collected multitude of bees are capable of heating the place that contains them. But the proportion of warmth which is induced in a city by the population, must be far less considerable than that which emanates from fires, the greater part of which are kept up for the very purpose of preventing the sensation attending the escape of heat from our bodies. A temperature equal to that of spring is hence maintained, in the depth of winter, in the included part of the atmosphere, which, as it escapes from the houses, is constantly renewed: another and more considerable portion of heated air is constantly poured into the common mass from the chimneys; to which, lastly, we have to add the heat diffused in all directions from the foundries, breweries, steam-engines, and other manufacturing and culinary fires.' Vol. ii. p. 104. To these direct additions of extraneous heat, Mr. Howard also adds the augmentation derived in summer, from the accumulation of the natural temperature by the artificial condition of the city.

The excess of the city temperature is least in spring and greatest in winter, and seems to belong entirely 'to the nights, which average 3°$\frac{7}{10}$ warmer than the country, while the heat of the days, owing without doubt,' as he says, 'to the interception of a portion of the solar rays by a constant veil of smoke, falls, in a mean of years, about a third of a degree short of that in the open plain.' The following is the proportional superiority of the London temperature in the twelve different months.

| | |
|---|---|
| January . | $\frac{1}{17}$ |
| February . | $\frac{1}{24}$ |
| March . | |
| April . | |
| May . | $\frac{1}{114}$ |
| June . | $\frac{1}{48}$ |
| July . | $\frac{1}{62}$ |
| August . | $\frac{1}{49}$ |
| September | $\frac{1}{36}$ |
| October . | $\frac{1}{26}$ |
| November | $\frac{1}{20}$ |
| December | |

The mean temperature of London, according to Mr. Howard, is 48° 30′ of Fahrenheit, or about 2° less than has usually been supposed. This varies, he says, in different years as much as 4° 30′, and the variations, he very singularly contends, are periodical, and appear to recur in

cycles of seventeen years. We cannot afford space for the detail of the circumstances which led him to form this opinion; but extract from the summary of the work an abridged enunciation of the fact:—

'We may consider one of these cycles as commencing either with 1790 or 1800, and ending with 1806 or 1816. In either case, a year of mean temperature begins the cycle, in which the coldest year falls at the end of ten years, and the warmest at the end of seven years, reckoning from the coldest, and thus alternately; both together including a complete revolution of mean temperature from its highest to its lowest extreme (or vice versa from the lower to the higher), and back again. The year 1816, which was the coldest of a cycle, appears to have had parallels in 1799 and 1782; and there is every reason to conclude, from present appearances, that the warm temperature of 1806 will re-appear in 1823, which will probably be the warmest, and 1833 the coldest, upon the whole year, of a cycle of seventeen years, beginning with 1807.' Vol. ii. p. 289. The greatest heat to which the climate of London is liable is 96°, the greatest cold is —5°: thus the full range of the thermometer is not less than 100°.

A temperature above 80° is almost always followed, either in our own or the neighbouring districts, by thunder-storms, which, in their turn, are succeeded by rain and a reduction of heat. Owing to our insular situation, and other causes, 'even in the coldest season of the year, the medium of the twenty-four hours, upon a long average, does not fall below the freezing point. Continued frost, in winter, is therefore, always an exception to the general rule of the climate.' p. 292. The following is the mean temperature of the different months, in whole numbers, in the vicinity of London: January 34°, February 39°, March 41°, April 46°, May 55°, June 58°, July 62°, August 61°, September 56°, October 50°, November 40°, December 37°. —The mean annual range is 72°. The mean diurnal range, or difference between the day and night is 14°; and this varies in the different months as follows, beginning with January, 8°, 10°, 12°, 15°, 17°, 18°, 17°, 17°, 16°, 13°, 10°, 8°.

Before we dismiss these comparative estimates of the temperature of our climate, we may compare from the respective works of Dr. Forbes, on the climate of Penzance, and Mr. Howard's Treatise, the mean temperature of the year in London and Penzance. Both works rank with our most accurate and faithful histories of the weather.

I.—*Mean Temperature.*

| | Jan. | Feb. | Mar. | April | May. | June. | July. | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| London . . . | 34 | 39 | 41 | 46 | 55 | 58 | 62 | 61 | 56 | 50 | 40 | 37 |
| Penzance . . | 41 | 44 | 44 | 49 | 56 | 60 | 62 | 61 | 58 | 53 | 46 | 43 |

II.—*Extreme Temperature.*

| | | Jan. | Feb. | Mar. | April | May. | June. | July. | Aug | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| London | Max. | 56 | 57 | 73 | 80 | 87 | 88 | 96 | 83 | 85 | 73 | 62 | 56 |
| | Min. | 8 | 11 | 18 | 22 | 29 | 36 | 39 | 37 | 26 | 24 | 17 | 14 |
| Penzance | Max. | 56 | 58 | 62 | 68 | 74 | 78 | 78 | 78 | 74 | 68 | 69 | 58 |
| | Min. | 19 | 26 | 28 | 32 | 42 | 45 | 52 | 50 | 42 | 37 | 28 | 22 |

It appears, from documents contained in Dr. Forbes's Essay, that the temperature of Penzance retains the same proportional superiority in the colder months over all the places usually esteemed the mildest in our island; for instance, the sea-coast of Devonshire, the Isle of Wight, Clifton, &c.; a fact which well accounts for, and justifies, the resort of consumptive invalids to the western extremity of Cornwall.

In thirteen years the thermometer, at 7 A. M. at Penzance, has only been thirty-seven times below the freezing point; consequently frost is stated to be of rare occurrence; and the exercise of skating entirely unknown among the young men of the place. The average number of days in the year on which snow falls is very little more than two and a half; and, out of the fourteen years, four are recorded on which no snow fell. As the most unequivocal proofs of the peculiar mildness of the winters, Dr. Forbes, at the end of his paper, gives lists of exotic and indigenous plants growing in the vicinity of Penzance; among which are several which we are not accustomed to see out of the green house. In the open grounds two crops of potatoes are often produced in the year. But the most striking feature of the climate in this district seems to be its equability.

During the prevalence of north and north-east winds, the barometer is generally highest in England, and lowest when it blows from the opposite points. Its highest range is from May to August: and the following are the extreme and mean results of seven different places.

| | | Derby. | Dover. | Keswick. | Liverpool. | Middlewich. | Sidmouth. | York. |
|---|---|---|---|---|---|---|---|---|
| Greatest | height | 30·48 | 30·95 | 30·28 | 30·95 | 31 | 30·61 | 30·75 |
| Mean | height | 29·74 | 29·9 | 29·55 | 29·74 | 29.5 | 29·93 | 29·7 |
| Least | height | 28·34 | 28·48 | 28·33 | 28·6 | 28 | 28·81 | 28·6 |

In estimating the mean height of the barometer in London and the neighbourhood, Mr. Howard takes the result of twenty years at Somerset House, viz. 29·823 inches; and that of his own ten years observation. The mean of the greatest elevations of the mercury in each month for the ten years, is 30·305; and of the greatest depressions 29·188. The mean of the maxima of each year is 30·555, and of the minima 28·557. The mean annual range is therefore 1·998 inches. The extreme range in the ten years is 2·49. The greatest elevation in the ten years occurred on the 24th of February, 1808, viz. 30·71; and the greatest depression on the 29th of January, 1814, viz. 28·22. The former condition took place during a moderate north-east wind, and the latter during strong southerly gales.

Mr. Howard has established another curious fact in his researches: viz. the decided influence of the moon on the barometer. By comparing the results of that instrument at the different phases, for a period of ten years, he found that the mercury 'suffers a depression of about a tenth of an inch, by the influence of the new and full moon respectively; while, at the first and third quarters, the moon's influence is, in respect of position in her orbit, neutral, producing neither elevation nor depression in the barometer.' p. 226. And, by comparing the barometric indications during different periods of the moon's declination, he ascertained that the quicksilver stands considerably above the mean, while the moon is south of the equator, and, in a like proportion, below it, while she is to the north of the equator. On further examining the temperature, winds, rain, &c., in the different periods answering to these varied affections of the moon's path, he ascertained, as might indeed have been expected, that these suffered corresponding, but certainly less uniform, changes.

Our *winds* blow with the greatest constancy, as well as strength, from the west and south-west, as is evinced by the leaning of the trees, in all parts exposed to its influence, towards the opposite quarters. This is thought to arise from the situation of the island with respect to the Atlantic and the Continent, and the difference of atmospheric temperature between them at certain seasons of the year. Next to these, the east and north-east winds are the most prevalent. It generally blows least from the south and north-west. So great is the inconstancy, however, that in summer it often blows from several points of the compass in the same day. In the maritime parts of England, especially in the south, during warm and settled weather, the sea-breeze prevails in the middle of the day, and the land-breeze, morning and evening. In the neighbourhood of London Mr. Howard's observations are, 1. A wind from the north or between that and the east prevails on an average seventy-four out of the 365 days of the year; the extremes being ninety-six and fifty-eight days. 2. A wind from east to west prevails fifty-four days, varying in different years from seventy-two to thirty-four days. 3. A wind from south to west 104 days, varying from 123 to seventy-eight. 4. A wind from west to north 100 days, varying from 124 to eighty-three. 5. Variable winds obtain about thirty-three days, or the remainder of the year, being for the extremes of fifty-one to seventeen days.

Mr. Howard has a valuable observation on the 'apparent anomaly of a north-west wind, predominating in our wettest season in summer, and a south-west during the autumnal rains.' 'I conclude,' he says, 'from a careful review of the cases, that the former is not the carrier but the condenser of the vapor, which appears to be introduced, at intervals only, from the south and south-east. When the surplus vapor has been disposed of in rain on these occasions, the north-west resumes its sway, the atmosphere recovers its transparency,—' et... ro cernes silvas Aquilone moveri,' Virg. b... is usually not long before the returning clouds indicate the near approach of a new supply of vapor.'

'In the decline of the year, the rain appears to originate in a somewhat different way. The great body of the atmosphere is then usually moving with some force from south-west to north-east, while the sun is declining to the southward. The air already turbid from beginning precipitation, is further charged below by an excess of evaporation from the agitation of much watery surface over which it passes. Every calm interval then affords its shower, followed by wind and evaporation again: and a succession of gales by night, and cloudy days, characterise the approach to the hibernal season.' —Vol. ii. p. 211.

Mr. Dalton estimates the average quantity of *rain* that falls throughout England at 31·3 inches: at Ware it has been averaged during five years at 23·6 inches. Mr. Howard gives it in London and the neighbourhood at somewhat above 25·0 inches. But the Royal Society during eleven years at only 21·25 inches. The quantity is distributed, throughout the year, according to Mr Howard, in the following proportions:

| | Inches. |
|---|---|
| January | 1·95 |
| February | 1·48 |
| March | 1·29 |
| April | 1·69 |
| May | 1·82 |
| June | 1·92 |
| July | 2·63 |
| August | 2·12 |
| September | 1·92 |
| October | 2·52 |
| November | 2·99 |
| December | 2·42 |

The following years have been the wettest of a series of twenty-three years, and in the order in which they are put down, viz. 1816, 1797, 1807, 1802; and it further appears that 'the warm years were uniformly dry, or below the average in rain, and the cold years uniformly wet, or above the average.' The proportion of rain by day and night is very different, being no less than one-third more in the latter period,—a fact which has been verified in different parts of the kingdom, and which is, doubtless, a beneficent arrangement of that same Providence, which has appointed the day for labor, and the night for rest. The greatest quantity of rain col-

lected in one diurnal space was 2·05 inches, on 26th of June, 1816. The average number of days on which any rain falls is 148,—an immense proportion, and strikingly exhibiting the wetness of our climate.

In considering the comparative humidity of different months and seasons, Mr. Howard confirms the popular adage of 'forty days' rain after St. Swithin' (15th of July), and comes to the conclusion, that although the notion will be found fallacious, if put to the test of experience at any one station in our island; yet that, 'in a majority of our summers, a showery period, which, with some latitude as to time and local circumstances, may be admitted to constitute daily rain for forty days, has come on about the time indicated by this tradition.' The fact itself is accounted for by the proximity of the summer solstice; as the second rainy period of the year is accounted for by the proximity of the winter solstice. In respect of the influence of particular winds in causing rain, Mr. Howard shows, by calculation, what was before generally known by common observation, that north-east winds are our dry-weather winds, and south-east our wet. The winds from west to north are, also, more or less connected with our fair weather, while those between the south and west have no decided connexion with either wet or dry weather. These remarks, however, are intended to apply only to London and its vicinity, or, at most, to the central parts of the island: the influence of the particular winds in the south-western extremity of Great Britain is very different. It may be further observed, after this author, that in the three dry years, 1807, 1808, and 1815, the proportion of north-easterly to south-easterly winds was nearly double, being 211 of the former, to 108 of the latter: while, in the wet years, 1810, 1812, 1814, and 1816, the proportion of the former to the latter was only as 323 to 269. In the wettest year of the series (1816) the south-easterly winds actually exceeded those from the north and east.

In an estimate of the moisture of this climate we must not omit to notice the *dew*, which Mr. Dalton estimates at an average annual depth of about six inches. The evaporation of South Britain he estimates at twenty-three inches.

The *soil* of the southern parts of Great Britain is extremely various. The downs of Sussex and the west, like the wolds of Yorkshire, are calcareous. Somersetshire, Devonshire, and Cornwall, contain a boundless variety of downs, rocks, marshes, heaths, and vales, intermixed in almost every direction; the most luxuriant slopes being not unfrequently crowned by the most barren summits. The soil of the midland counties is more uniform, being generally a strong loam, though sandy soils cover a large space in Nottinghamshire, and calcareous earth abounds in many parts of Northampton. That species of ferruginous soil called red land by the farmers, is also found in these districts. Staffordshire and Derbyshire have large tracts of peat or moss; but Norfolk is almost entirely a sandy loam, except in the eastern part, where clay appears. In the wealds of Kent, Sussex, and Surrey is the greatest surface of unbroken clay land. Clay also abounds with other strong soils in the north: the highest ranges are of course rocky, and abound with peat; lower down is a lighter loam.

The woodland counties are Kent, Surrey, Sussex, Hampshire, Worcestershire, and Cheshire, with parts of Oxfordshire, Berkshire, Leicestershire, and Northamptonshire, to which may be added, a portion of Yorkshire. The western side of the island is, in general, better wooded than the eastern. The timber of England and Wales has been estimated as equal in value to two years' rent of the land. It consists principally of the noble oak, the ash, elm, lime, beech, chestnut, sycamore, maple, birch, alder, abele, hornbeam, aspin, and poplar.

The entire quantity of land in England and Wales has been estimated at 37,334,000 acres: giving for England 32,134,000, and for Wales 5,200,000. The uncultivated portions (including towns, villages, roads, and waters) at 6,714,000 acres, leaving nearly 31,000,000 of acres, covered with profitable timber, or devoted to agricultural improvement. The Board of Agriculture states that 12,000,000 of acres are employed in pasturage, and 4,000,000 for the dairy. About 40,000 acres are occupied as hop-grounds and nurseries; and 50,000 as pleasure-grounds, and fruit and kitchen-gardens. The land in an actual state of tillage has also been estimated at 12,000,000 of acres; of which about 3,200,000 are sown with wheat. Mr. Arthur Young, however, estimates this last quantity at 3,399,326 acres: Dr. Colquhoun states the property annually created in Great Britain and Ireland, by agriculture, at £216,817,624. Mr. Middleton, in his Agricultural Survey of Middlesex, takes the whole value of this produce in England and Wales, in 1800, at £126,690,000. The number of farms has been taken at 2,000,000. The rental of land appears to be about £28,000,000 sterling, and the amount of tithes £2,193,994.

Mr. Comber, in his work on National Subsistence, gives the following computation of the land under cultivation in England and Wales; and its mode of being cultivated. It will be found to differ little from that we have adopted:

| | Acres. |
|---|---|
| Wheat | 3,300,000 |
| Barley and rye | 1,000,000 |
| Oats and beans | 3,000,000 |
| Clover, rye, grass, &c. | 1,200,000 |
| Roots and cabbage cultivated by the plough | 1,200,000 |
| Fallow | 2,300,000 |
| Hop-grounds | 34,000 |
| Nursery-grounds | 9,000 |
| Fruit and kitchen-gardens | 41,000 |
| Pleasure-grounds | 16,000 |
| Land depastured by cattle | 17,000,000 |
| Hedgerows, copses, and woods | 1,600,000 |
| Ways, water, &c. | 1,300,000 |
| Commons and waste lands | 5,094,000 |
| Total | 37,094,000 |

Grazing, dairy, and arable land divide the occupation of the farmer. In the first the coun-

ties of Leicester, Lincoln, Northampton, parts of Yorkshire and Durham, with Somersetshire, are conspicuous. The dairy counties are Cheshire, Gloucestershire, Shropshire, Wilts, Bucks, Devonshire, Dorsetshire, Essex, Suffolk, Cambridgeshire, Derbyshire, and Yorkshire. The arable farms of greatest extent are found in Northumberland, Durham, Yorkshire, Norfolk, Suffolk, Kent, Surrey, Sussex, Essex, Hertfordshire, Hampshire, Bedfordshire, and Berks.

Wheat, our most important grain, is grown in all the last-mentioned districts, to the extent of 3,200,000 acres, which yield about twenty bushels on an average per acre. The barley counties are Norfolk, Suffolk, Cambridge, Bedfordshire, Leicestershire, Nottingham, and Berkshire, with the upper parts of Herefordshire, Warwickshire, and Shropshire. Oats are grown in the northern and fenny tracts of the eastern and midland counties. Rye, which is not so much cultivated as formerly, is found in the higher and sandy soils of the hilly districts: as are peas. Beans flourish in all the strong lands of the kingdom: and clover, tares, and sainfoin are, like potatoes, every where to be found. The last, however, attain their greatest perfection in Lancashire and Cheshire. Turnips are also considered, in most counties, a general crop, and frequently adopted instead of the naked fallow of the old farmers. Cabbages are in some districts grown as food for cattle. Hemp and flax are also occasionally cultivated. Hops distinguish Kent, Sussex, and Surrey; they are also grown in Essex, Hampshire, Nottinghamshire, Worcestershire, and Herefordshire: but Farnham (Surrey) has long been noted for the best of these precarious crops. Seeds and medicinal plants of various kinds are reared on a large scale in several parts of England; as canary-seed, in the Isle of Thanet; coriander and carraway, in Essex; mustard, in Durham, the Isle of Ely, and Essex; rape, in the counties of York and Lincoln; poppy-seed and saffron, in Essex and Cambridgeshire; madder and woad, in Kent; and chamomile, in Derbyshire. Apples, pears, plums, cherries, peaches, apricots, nectarines, currants, gooseberries, raspberries, and other garden fruits are produced in great plenty throughout the country; but the wet weather, and the changeable nature of our climate generally, are injurious to their perfection. Artichokes, asparagus, cauliflowers, cabbages, coleworts, brocoli, peas, beans, kidney-beans, spinage, beets, lettuce, celery, endive, turnips, carrots, potatoes, mushrooms, leeks, onions, and shallots (though several of them not indigenous), are now, in a manner, naturalised to our soil, and are raised in great plenty in our kitchen-gardens.

The orchards of Worcestershire, Herefordshire, Gloucestershire, Somersetshire, and Devonshire, supply the manufacturers of cyder and perry, or other parts of the country, with fruit. Marshall estimates that the four counties of Worcester, Gloucester, Hereford, and Monmouth, yield annually about 30,000 hogsheads of cyder; 10,000 of which, besides 1000 hogsheads of perry, and 1500 tons of fru[illegible] the produce of the first county alone. The [illegible]t of fruit from that county has amounted to 20[illegible]ons annually.

Kent is distinguished for its cherries and filberts; the latter of which occupy some hundred acres of land near Maidstone.

The increase of the expense of cultivating land in England, in modern times, is a subject of some interest to many of our readers. The Board of Agriculture has thus exhibited the averages of three distinct and distant years, which speak for themselves.

| Average Expense of Cultivating 100 Acres of Land, for the following Years. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1790. | | | 1803. | | | 1813. | | |
| | £ | s. | d. | £ | s. | d. | £ | s. | d. |
| Rent | 83 | 6 | [illegible]3¼ | 121 | 2 | 7¼ | 161 | 12 | 7¾ |
| Tithe | 20 | 1[illegible] | 1¾ | 26 | 8 | 0¼ | 38 | 17 | 3¼ |
| Rates | 17 | [illegible]3 | 10 | 31 | 7 | 7¾ | 38 | 19 | 2¾ |
| Wear & Tear | 15 | 13 | 5¼ | 22 | 11 | 10¼ | 31 | 2 | 10¾ |
| Labor | 8[illegible] | 5 | 4¾ | 118 | 0 | 4 | 161 | 12 | 11¼ |
| Seed | [illegible] | 4 | 10¼ | 49 | 2 | 7 | 98 | 17 | 10 |
| Manure | [illegible]8 | 0 | 3 | 68 | 6 | 2 | 37 | 7 | 0¼ |
| Team | 67 | 4 | 10 | 80 | 8 | 0¼ | 134 | 19 | 8¼ |
| Interest | 22 | 11 | 11½ | 30 | 3 | 8¾ | 50 | 5 | 6 |
| Taxes | | | | | | | 18 | 1 | 4 |
| Tot[illegible] | 411 | 14 | 11¾ | 547 | 10 | 11½ | 771 | 16 | 4¼ |

First among the valuable animals of England ranks its breed of various descriptions of horses. The whole number kept in Great Britain has been estimated at 1,500,000, and includes every valuable variety of that noble animal. The breeds of cattle in various parts of the kingdom have been also cultivated with the greatest care. The entire number of the live stock of this kind in Great Britain is about 5,500,000. Sheep are also objects of great attention and importance throughout England. The introduction of Merinos, and the astonishing modern extent of our manufactures, have together operated as a powerful stimulus in this branch of grazing. Long-wooled sheep abound on the eastern side, and in the low tracts of the island. The annual produce of their wool has been estimated at 137,000 packs, of 240 lbs. each. Short-wooled sheep are kept on all the upland districts, both of England and Wales. Their wool is fine; and the number of them is taken at nearly 15,000,000. That of the long-wooled sheep at between 4,000,000 and 5,000,000. The annual produce of short wools is supposed to amount to 231,000 packs. If the lambs be added, the total number will amount to 26,000,000, and their wool to more than 400,000 packs.

Animals of inferior consequence are—the patient and degenerated ass, whose numbers are much diminished; the mule; the deer; the goat; the English mastiff and bull-dog; the fox; and the hare. The wild-cat is still found in some of the mountainous and woody parts, as well as the badger, otter, marten, several species of the weasel tribe, the squirrel, mole, dormouse and hedge-hog. No wild animals of an important size remain in any part of the kingdom; and the reptiles and numerous insect tribes are com-

paratively harmless. The English birds of prey are chiefly of the eagle and hawk kinds; but the former are not frequently found: and the bustard, sometimes weighing from twenty to twenty-five pounds, may be considered as the largest of the British birds. The golden-crested wren is the least. The most admired of our songsters is the nightingale; the wheatear is the most delicate bird brought to table. Of wild fowl, the most useful are the goose, duck, teal, and widgeon, vast numbers of which are caught annually in the fens, and supply an extensive article of food. Birds of passage annually visit both North and South Britain; among which are the snipe, woodcock, and several species of plover. Game is plentiful in most counties. Poultry and domestic fowls we need hardly observe are every where seen. Many parts of the coast are well stocked with water-fowl and shell-fish; particularly lobsters, crabs, and oysters. The rivers, lakes, and surrounding seas, abound also with a great variety of other fish. The most common of those in our rivers and inland waters are the salmon, trout, pike, eel, perch, carp, sturgeon, and char. On the southern coast the migratory pilchard, and mackerel (which are only caught near the southern part of the island), abound, while herrings are common to all parts. Other much esteemed fish are the turbot, cod, sole, ling, halibut, plaice, haddock, whiting, smelt, mullet, doree, and bret. The shark is occasionally seen, and the whale visits the northern coast, where also the seal and the sun-fish appear. The fisheries round our coasts, and those of Ireland, including inland fisheries, amount in annual value to about £3,000,000 in England and Wales: in Great Britain, including Ireland, at least £10,000,000. See FISHERIES.

It has been estimated that the private property vested in the *mines* and *minerals* of England and Wales cannot be less in value than £68,000,000 sterling; and that in the whole of Great Britain, including Scotland and Ireland, the value is at least £75,000,000. Iron, copper, lead, tin, salt, alum, coals, stones of various kinds, lime, chalk, slate, &c., are found in vast quantities; and the new discoveries in chemistry have extracted many valuable productions from our minerals and fossils. But the eastern and southern parts of the kingdom are wholly destitute of these treasures. Gold has been discovered in particular spots, but in too small quantities to defray the expense of obtaining it; and silver is only to be met with in conjunction with lead or copper ore. Iron is our staple metal, and coal most abundant. Black-lead is a useful production, almost peculiar, it is said, to this country. Rock-salt is a considerable article of export. Marble, spar, and excellent stone for building, are common; together with fullers-earth and the finest clay.

The valuable article of *coal* abounds most in Northumberland, Cumberland, Durham, and Yorkshire; but Westmoreland is destitute of it entirely. Derbyshire, Staffordshire, Shropshire, Leicestershire, and Warwickshire, contain numerous veins. Gloucestershire, Somersetshire, and Monmouthshire, in the west. possess fossil coal, as also does Bovey Heath, in Devonshire. It also extends into various parts of the principality. In 1792 it was computed that 64,724 men and boys were engaged in raising or conveying coal on the rivers Weare and Tyne; and Dr. Thompson states the length of the Newcastle coal formation, from north to south, at twenty-three miles, and its medium breadth at eight miles; giving a superficial extent of more than 180 square miles, or 557,568,000 square yards. The thickness of all the seams at present worth working, is said to be about ten yards. The whole quantity of coal in this district, therefore, amounts to 5,575,680,000 cubic yards. More than 2,000,000 of chaldrons are annually exported. This, including the waste, the above writer computes at 37,000,000 of cubic yards; and, by dividing the whole quantity in the formation by this, the quotient shows that these mines may be worked at the same rate, for 1500 years, before they will be exhausted. By making the requisite reductions for what has already been worked, and other circumstances affecting the consumption, amounting to one-third of the whole, he concludes, that this formation will supply coal, at the present rate of expenditure, for 1000 years from the present time.

The iron districts are the northern parts of Lancashire, Derbyshire, Gloucestershire, and Shropshire. It is also obtained in Northumberland, Cumberland, and Durham; as well as in Yorkshire, Staffordshire, Worcestershire, Wiltshire, Somersetshire, Devonshire, and Monmouthshire. The iron mines of England and Wales, yield together 200,000 tons of pig-iron. Lead is chiefly obtained in Northumberland, Cumberland, Westmoreland, Durham, Yorkshire, Derbyshire, Somersetshire, and Devonshire. Those of Derbyshire are the most ancient lead-mines in the kingdom, having been worked by the Romans. The present produce annually is about 600 tons. But those near Alston, on the borders of Cumberland and Northumberland, yield double that quantity. Britain has been considered, from a still earlier period, as the depository of tin. This, at present, is exclusively confined to the south-west promontory of the island, which yields about 300 tons annually. The people employed in the various processes by which this metal is obtained, are stated at the number of 10,000; and the yearly value of the produce at £500,000. Copper is found in various parts of the great chain of mountains which extend from Cumberland to Cornwall, and in the Isle of Anglesey. The principal mines are in Derbyshire, Anglesey, Cornwall, and Devonshire. Mr. Grenfell states, that the mines of Cornwall and Devonshire, yield about 80,000 tons of ore annually; affording not above 8000 tons of copper, the worth of which may be estimated at about £1,200,000.

Zinc appears in Derbyshire; alum in Yorkshire; gypsum in Derby and Nottingham; fullers-earth in Surry, Berks, and Bedfordshire; potters-clay in Staffordshire, and at Purbeck, Dorsetshire; superior slate is found in the north of England, and in Cornwall, Devonshire, and Leicestershire.

The principal salt mines of this kingdom are those of Northwich, Cheshire. They were dis-

covered in 1670; but the salt-springs of that county were known to the Romans; the whole annual produce of these mines is about 60,000 tons. The brine-springs in the vicinity of Nampt-wich and Middlewich, in the same county, contain about twenty-five per cent. of the fossil, and yield about 45,000 tons annually of fine white salt. Worcestershire, also, contains some productive springs; those of Droitwich yield 600,000 bushels annually. Salt is also found in a spring at Weston, Staffordshire.

Our quarries of stone, as being wholly found in the hilly districts or on the western side of the kingdom, are of course not available for the ordinary purposes of building at a distance: the produce of them, altogether, compared with that of the mines and iron-works, is not considerable; as appears from the following return of the

Profits of the Quarries, Mines, and Iron-works, in 1810, in the counties where they are principally situated: extracted from the parliamentary papers on the property tax.

| Counties. | Quarries. | Mines, as well of Coal as of Iron, Copper, Tin, and Lead. | | Iron-works. |
|---|---|---|---|---|
| | £ | | £ | £ |
| Cheshire | 877 | Coal and iron | 9,568 | 8,354 |
| Cornwall | 2,147 | Tin and copper | 106,028 | |
| Cumberland | 952 | Coal | 32,466 | 656 |
| Derbyshire | 1,959 | Coal and iron | 18,678 | 34,613 |
| Devonshire | 3,907 | Tin, copper, and iron | 10,830 | 13,043 |
| Durham | 1,668 | Chiefly coal | 51,071 | 12,259 |
| Yorkshire | 3,800 | Chiefly coal | 34,506 | 7,859 |
| Lancaster | 3,248 | Coal and iron | 30,813 | 18,726 |
| Northumberland | 3,796 | Chiefly coal | 45,013 | 17,420 |
| Shropshire | 1,706 | Coal and iron | 21,058 | 6,430 |
| Staffordshire | 327 | Coal and iron | 21,366 | 8,393 |
| Warwickshire | — | Iron | 250 | 16,715 |
| Flintshire | — | Coal | 14,019 | |
| Glamorganshire | — | Coal and iron | 28,057 | 29,660 |
| Monmouthshire | — | Coal and iron | 11,980 | 2,362 |
| Other counties | 4,573 | | 47,788 | 46,182 |
| Total | 28,960 | | 483,491 | 222,672 |

Sir Frederick Eden in 1812 supposed £116,000,000 to be the annual amount of British manufactures insurable in Great Britain. These he distributed as follows:—British manufactures for home consumption; namely, woollens £11,000,000; cotton goods £6,000,000; leather £12,000,000; flax £2,000,000; hemp £2,000,000; glass £2,000,000; paper £1,500,000; porcelain and pottery £2,000,000; silk £3,000,000; hardware £6,000,000; beer £10,000,000; spirits £4,000,000; soap £1,500,000; salt £1,000,000; candles £2,000,000; miscellaneous articles £10,000,000; making a total of £76,000,000: to which he adds, of British manufactures for exportation, £40,000,000. The value of foreign merchandise deposited in warehouses, shops, &c., and either paid for or virtually paid by debts owing to this country by foreigners, has been estimated at £33,000,000 in England and Wales; at £40,000,000 in Great Britain and Ireland.

Of these the manufacture of woollens of different kinds is the most ancient, and has been considered the staple fabric of the country. Though introduced as early as the time of the Romans, it dated its pre-eminence from the reign of Edward III., and is, at present, chiefly confined to the southern division of the island. The value of the articles annually produced is about £18,000,000, and the number of persons employed in them about 500,000. The cotton manufacture was introduced about the middle of the seventeenth century, and, at the commencement of the eighteenth, did not employ an eightieth part of its present hands. It is now unrivalled in any other country. Manchester, Preston, Bolton, Blackburn, and Wigan, are now its principal seats in England. The annual value of this manufacture to Great Britain is estimated at £20,000,000; and the number of individuals employed in it at 600,000. The linen manufacture, partly superseded by that of cotton, does not now exceed in annual value £2,000,000, or £2,500,000.

The following is an exhibition of the rise, progress, and present state of the cotton manufacture in Great Britain. From 1770 to 1780 the importation of cotton wool averaged 5,735,575 lbs. per annum; from 1781 to 1790 about 18,000,000 lbs. weight; and from 1791 to 1801 about 32,000,000. And the following is a statement of the quantity imported in each of the twenty-two years 1802—1823, distinguishing the several countries whence imported and the number of bags and bales from each respective country

| Years. | COTTON WOOL IMPORTED FROM United States of America. | Brasils and Portugal. | East Indies. | West Indies, &c. | Total No. of Bags & Bales. | Total in lbs. weight. | Quantity in lbs. weight taken for spinning in each of the Nine Years, 1815—1823. |
|---|---|---|---|---|---|---|---|
| 1802 | 107,494 | [illegible]74,720 | 8,535 | 90,604 | 281,383 | 77,393,600 | |
| 1803 | 106,831 | [illegible]297 | 10,296 | 45,474 | 238,898 | 59,921,990 | |
| 1804 | 104,103 | 4[illegible]8 | 2,661 | 86,385 | 241,637 | 70,506,355 | |
| 1805 | 124,279 | 51[illegible] | 1,983 | 75,116 | 252,620 | 72,229,537 | |
| 1806 | 124,939 | 51,[illegible] | 7,787 | 77,678 | 261,738 | 75,157,530 | |
| 1807 | 171,267 | 18,9[illegible] | 11,409 | 81,010 | 282,667 | 86,206,870 | |
| 1808 | 37,672 | 50,442 | 12,512 | 67,512 | 168,138 | 22,676,740 | |
| 1809 | 135,000 | 166,170 | 35,764 | 103,511 | 442,382 | 117,775,530 | |
| 1810 | 240,516 | 149,535 | [illegible]79,382 | 92,186 | 561,173 | 136,570,735 | |
| 1811 | 128,192 | 118,514 | [illegible]14,646 | 64,789 | 326,141 | 91,662,535 | |
| 1812 | 95,331 | 98,714 | [illegible]2,617 | 64,563 | 261,215 | 63,027,570 | |
| 1813 | 37,721 | 137,168 | [illegible]421 | 73,218 | 249,503 | 49,820,530 | |
| 1814 | 48,000 | 151,500 | 1[illegible]500 | 74,500 | 287,500 | 59,745,373 | |
| 1815 | 201,000 | 91,200 | 24[illegible]00 | 54,900 | 371,400 | 96,720,370 | 90,537,350 |
| 1816 | 166,000 | 124,000 | 31,[illegible]0 | 49,000 | 370,000 | 94,140,330 | 90,350,230 |
| 1817 | 195,560 | 114,490 | 117,9[illegible]5 | 49,155 | 477,160 | 125,132,230 | 110,532,210 |
| 1818 | 219,950 | 160,200 | 247,3[illegible] | 57,850 | 660,300 | 177,257,375 | 112,235,750 |
| 1819 | 212,250 | 125,450 | 178,3[illegible] | 31,070 | 545,070 | 150,735,728 | 110,235,570 |
| 1820 | 301,200 | 179,700 | 57,3[illegible] | 31,950 | 577,150 | 143,637,325 | 128,735,235 |
| 1821 | 300,100 | 121,050 | 29,700 | 37,250 | 488,100 | 128,573,275 | 128,527,725 |
| 1822 | 330,000 | 143,200 | 19,300 | 40,650 | 533,150 | 139,797,735 | 140,795,375 |
| 1823 | 448,070 | 148,070 | 38,650 | 33,610 | 668,400 | 180,233,795 | 150,325,795 |

The following is an account of the official value of the cotton wool imported; the number of bags and bales, and the official value thereof re-exported; and the official and declared real value of the quantity of cotton yarn and of cotton manufactures exported to all parts of the world, except Ireland, in each of the ten years, 1814—1823.

The official values imply a fixed value assigned by the government in 1694; and may or may not have a relation to the real value of the present time; but they are important and interesting as denoting an increase or decrease of quantity.

| Years. | Official value of raw imported. | EXPORTED. Raw. Bags. | Raw. Value. | Value of Yarn. Official. | Value of Yarn. Real. | Value of Manufactures. Official. | Value of Manufactures. Real. |
|---|---|---|---|---|---|---|---|
| 1814 | 2,030,862 | | 366,270 | 1,119,850 | 2,791,248 | 16,690,366 | 17,393,796 |
| 1815 | 3,335,564 | | 397,664 | 808,853 | 1,674,021 | 21,699,505 | 19,124,061 |
| 1816 | 3,160,075 | 30,000 | 343,768 | 1,380,486 | 2,628,448 | 16,335,124 | 13,072,758 |
| 1817 | 4,161,824 | 22,700 | 721,430 | 1,125,257 | 2,014,181 | 20,357,147 | 14,178,021 |
| 1818 | 5,767,547 | 60,000 | 1,245,781 | 1,296,776 | 2,385,305 | 21,627,936 | 16,643,579 |
| 1819 | 4,871,513 | 65,800 | 1,085,536 | 1,585,753 | 2,516,783 | 16,876,206 | 12,388,833 |
| 1820 | 4,957,057 | 27,500 | 370,610 | 2,022,153 | 2,826,643 | 20,704,600 | 13,843,569 |
| 1821 | 4,347,258 | 51,000 | 1,062,302 | 1,898,695 | 2,307,830 | 21,639,493 | 13,786,958 |
| 1822 | 4,731,252 | 58,700 | 1,279,263 | 2,353,317 | 2,700,437 | 24,566,920 | 14,534,253 |
| 1823 | 6,241,561 | 39,700 | 707,312 | 2,425,419 | 2,625,947 | 24,117,549 | 13,751,415 |

By the first of the above statements it appears that the total quantity of cotton wool imported in the nine years 1814—1823, has amounted to about 1,235,000,000 lbs. weight, and the stock on hand at the close of the year 1814 having been about 24,000,000 lbs., it makes a total quantity of 1,260,000,000 lbs. weight in the nine years to be accounted for: which has been disposed of in the following manner, viz. 1,062,000,000 lbs. weight taken for spinning; 105,000,000 ditto re-exported in a raw state; and 92,000,000 lbs. remaining on hand at the close of the year 1823.

Government used much exertion, in the seventeenth century, to improve and extend the manufacture of silk, which was greatly promoted by the settlement of the French refugees in London, Canterbury, &c. Spitalfields is, to this day, the principal place where silk weaving constitutes the employment of the population: it occupies about 30,000 people in that district of the metropolis. Coventry, Derby, Leek, and Macclesfield, also participate in this manufacture. The value of the whole produce has been stated at £4,200,000; and the persons employed, comprising a great number of women and children, is about 70,000.

The manufacture of stockings, chiefly confined to the counties of Nottingham, Leicester, and Derby, is most extensive in the first two counties. It has been computed that more than 20,000 persons in Leicestershire are employed in producing hosiery to the value of £1,500,000 annually. The goods made in Nottinghamshire are chiefly silk and cotton.

But our hardware is the most celebrated of our existing manufactures: 95,000 tons of iron, worth in the raw state £5,000,000 sterling, are supposed to be annually devoted to this object; and the men employed in working this metal to amount, at least, to 200,000. The seats of the great hardware manufactories are at Birmingham, Sheffield, and London (see CUTLERY), where, exclusively, much of the finer and more valuable work is performed. At Birmingham, and the contiguous district of about fifteen miles each way, it is estimated that 100,000 persons are engaged in the larger works. The brass foundry, which is principally confined to that town, is supposed to employ nearly 10,000 people; the button trade from 7000 to 10,000; brace-making 1000; the jewellery and gilding business, from 6000 to 7000; and the burnishing line nearly 20,000! The aggregate annual value of Birmingham articles has been stated at £2,000,000.

Sheffield and its neighbourhood are distinguished for the making of steel, and the manufacture of cutlery and files; as well as for plated goods. The whole are supposed to occupy about 30,000 of its inhabitants, and to be worth, annually, £1,200,000. The entire annual value of articles made of iron in England and Wales is taken at £10,000,000 sterling; and the number of people employed, at 200,000: brass and copper articles at £3,000,000, and the people employed on them, 50,000: steel, plated, and hardware goods, and toys at £4,000,000, and the people employed at 70,000.

This view of the importance of our hardware manufacture will be confirmed by adverting to the following statement from returns made to the house of commons of its value annually, as an export during the years 1830—1.

METALS AND HARDWARE EXPORTED FROM BRITAIN, DURING THE YEARS FOLLOWING.

| HARDWARE AND CUTLERY. | 1830. | | 1831. | |
|---|---|---|---|---|
| | Tons. | Dec. Value. | Tons. | Dec. Value |
| Bar Iron and unrought Steel . . | 13,369 | 1,410,936 | 16,799 | 1,620,631 |
| Unwrought Iron . . . . . . | 89,182 | | 93,547 | |
| Wrought Iron . . . . . . | 27,951 | | 30,227 | |
| | 1832. | | | |
| | Cwts. | | | |
| British Tin . . . . . . . | 21,762 | | | |
| Foreign do. . . . . . . . | 12,225 | | | |

Clocks and watches, with various jewellery articles, and cut glass, are manufactured to great perfection in the metropolis; where also all the best astronomical, optical, and other scientific instruments are exclusively made. Here alone also is the beating out of gold leaf engaged in. The plate glass and mirrors of England now rival any in the world: the value of this manufacture is estimated at £1,000,000, and the people engaged in it at 40,000.

Tanneries are of frequent occurrence in England: one of the most extensive in the metropolis engages also in the manufacture of Morocco leather, importing its superior goat skins direct from Mogador. The value of the various leather articles, annually made, such as shoes, gloves, harness, saddlery, &c., has been estimated at nearly £10,000,000.

The manufacture of earthenware and porcelain has greatly improved in this country of late. The best clay used in Staffordshire and Worcestershire, the seat of these manufactures, is brought from the Isle of Purbeck, and the coasts of Dorset and Devon. Thousands of tons of flint are also sent hither from the chalk-pits of Kent, and other materials from Cornwall. The principal places in the pottery district of Staffordshire, are Burslem and Etruria, the latter the property of Mr. Wedgewood, to whose family the Staffordshire potteries are much indebted. The annual value of this manufacture is £2,000,000; the persons employed in it about 40,000. Nearly 40,000 tons of shipping are employed in conveying the materials for it to Liverpool, and about 30,000 in exporting or conveying coastwise the finished articles. Superior porcelain is also made at Worcester, Derby, Colebrook-dale, in Shropshire, and Swansea.

Paper, which was once largely imported, is now a valuable export, and principally manu-

factured within a circle of eighty miles from the metropolis. It is supposed to amount, as a manufacture, to the annual value of £1,000,000. Manufactures of a more restricted nature, or inferior extent, we can hardly be expected to particularise. That of gunpowder, however, is worthy of notice, as also that the government certainly excels private manufacturers in making this article; distilleries, sugar-refineries, soap-houses, vitriol, copperas, and white lead manufactories; salt-works, roperies, breweries, hat-manufacturers, &c. &c., are other occupations of the English manufacturing population, which are important to the comfort of every class of society. In the construction of carriages (see our article COACH-MAKING) we have also arrived at distinguished success, and export this elegant manufacture largely.

The following table exhibits the progressive increase of production in some important articles which we cannot more particularly enumerate.

STATEMENT of the thousa[illegible] of BRICKS and TILES; pounds weight of TALLOW and SPERMACETI CANDLES; and of HARD [illegible] SOFT SOAP, and STARCH, charged with Excise Duty in each of the Years 1782—1823. 183[illegible]

| Thousands. | | lbs. of Candles. | | lbs. of Soap. | | lbs. of Starch. |
|---|---|---|---|---|---|---|
| Bricks. | Tiles. | Tallow. | Wax. | Hard. | Soft. | |
| The duty on Bricks and Tiles commenced September 1st. 1784. | | 50[illegible]50,922 | 194,001 | 40,908,579 | | 6,936,145 |
| | | 48,[illegible]5,439 | 184,864 | 28,427,641 | 2,342,932 | 5,378,017 |
| | | 49,[illegible],424 | 132,456 | 32,965,595 | 2,868,813 | 6,714,049 |
| 358,783 | 56,045 | 46,1[illegible]705 | 258,588 | 33,076,540 | 2,812,470 | 6,271,041 |
| 495,649 | 68,379 | 47,86[illegible]320 | 305,322 | 33,967,547 | 2,749,717 | 6,610,685 |
| 635,785 | 82,997 | 47,730[illegible]89 | 333,396 | 31,998,634 | 2,885,229 | 5,951,689 |
| 668,180 | 74,352 | 50,471[illegible]69 | 341,440 | 34,843,210 | 2,711,201 | 6,069,634 |
| 590,279 | 63,903 | 51,524[illegible]11 | 322,353 | 35,970,363 | 2,546,725 | 6,395,066 |
| 711,191 | 69,006 | 51,999,301 | 385,518 | 37,288,126 | 2,775,706 | 6,973,665 |
| 749,855 | 74,097 | 54,418,211 | 401,544 | 38,949,389 | 2,969,272 | 7,775,835 |
| 807,956 | 74,895 | 54,860,096 | 466,577 | 40,116,109 | 2,818,191 | 8,454,761 |
| 908,890 | 76,672 | 59,101,046 | 486,616 | 40,359,760 | 2,634,844 | 7,277,771 |
| 787,673 | 84,963 | 59,440,087 | 515,994 | 44,841,692 | 2,514,235 | 7,921,623 |
| 559,266 | 68,048 | 58,072,944 | 526,415 | 44,142,747 | 2,660,637 | 8,620,938 |
| 633,008 | 80,214 | 56,117,750 | 460,449 | 43,466,468 | 2,754,406 | 1,913,854 |
| 517,708 | 71,770 | 58,651,846 | 439,618 | 43,591,644 | 2,635,176 | 3,142,488 |
| 516,804 | 66,748 | 61,061,176 | 484,775 | 47,637,593 | 2,503,388 | 7,312,730 |
| 421,322 | 58,255 | 64,374,528 | 573,844 | 47,987,135 | 2,580,643 | 5,878,709 |
| 543,061 | 69,873 | 61,721,251 | 575,388 | 46,867,555 | 2,339,125 | 2,879,315 |
| 674,669 | 78,867 | 62,854,082 | 596,596 | 45,687,930 | 1,928,130 | 301,968 |
| 698,597 | 61,915 | 64,753,726 | 544,581 | 46,518,400 | 2,377,122 | 2,541,472 |
| 842,075 | 86,477 | 69,041,070 | 586,223 | 53,174,226 | 3,018,825 | 4,857,129 |
| 795,686 | 90,321 | 68,369,863 | 571,168 | 51,367,419 | 2,625,004 | 3,802,257 |
| 845,646 | 93,599 | 73,674,559 | 609,827 | 56,831,640 | 3,087,220 | 3,362,202 |
| 933,304 | 88,717 | 71,093,286 | 684,347 | 58,678,031 | 3,086,680 | 3,677,611 |
| 831,386 | 82,004 | 75,584,249 | 711,859 | 60,967,571 | 3,126,122 | 4,224,127 |
| 841,710 | 86,310 | 73,453,857 | 701,413 | 64,725,251 | 3,643,879 | 4,094,651 |
| 779,295 | 86,803 | 59,600,379 | 683,670 | 53,590,887 | 3,553,978 | 3,059,906 |
| 874,373 | 89,530 | 71,144 004 | 737,868 | 63,282,665 | 4,279,309 | 3,741,503 |
| 950,547 | 90,631 | 73,160,119 | 737,411 | 61,009,792 | 3,277,543 | 3,979,685 |
| 939,611 | 91,711 | 75,429,839 | 771,333 | 62,002,776 | 4,045,406 | 3,216,006 |
| 912,036 | 93,328 | 69,053,888 | 749,976 | 60,177,702 | 3,835,752 | 1,770,942 |
| 758,123 | 83,647 | 73,286,138 | 827,655 | 61,264,182 | 3,898,005 | 3,871,306 |
| 778,390 | 80,850 | 77,826,630 | 874,819 | 68,723,292 | 4,466,354 | 4,146,436 |
| 696,705 | 71,857 | 81,052,198 | 850,148 | 70,451,190 | 4,544,961 | 2,867,087 |
| 697,276 | 71,671 | 77,933,227 | 881,247 | 64,735,555 | 3,793,243 | 2,423,907 |
| 812,582 | 79,356 | 77,251,728 | 862,896 | 67,983,858 | 4,415,873 | 3,398,051 |
| 1,065,066 | 94,747 | 80,834,344 | 833,446 | 69,221,108 | 4,747,173 | 4,198,332 |
| 979,768 | 86,815 | 82,474,590 | 851,447 | 74,278,637 | 5,303,660 | 4,351,138 |
| 964,419 | 80,265 | 87,369,173 | 880,760 | 78,914,979 | 5,614,200 | 4,411,303 |
| 977,212 | 71,387 | 89,255,555 | 861,328 | 80,932,043 | 5,786,637 | 5,041,884 |
| 1,119,236 | 73,803 | 97,243,368 | 871,230 | 88,352,216 | 6,525,744 | 5,912,840 |
| 1,090,805 | 68,547 | | | 117,157,916 | 10,209,519 | 6,992,890 |
| 1,096,696 | 66,763 | | | 108,956,030 | 9,641,907 | 6,782,218 |

Return of the Official Value of British and Irish Produce and Manufactures, and of Foreign and Colonial Produce and Manufactures, exported from Great Britain, distinguishing the several countries, together with the Imports into Great Britain from the same countries, for the year ending 5th of January, 1833:—

| | United Kingdom. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Countries. | Official Value of Imports. | | | Official Value of Exports. British and Irish Produce and Manufactures. | | | Official Value of Exports. Foreign and Colonial Merchandise. | | | Total Exports. | | |
| | £. | | d. | £. | s. | d. | £. | s. | d. | £. | s. | d. |
| Russia | 4,696,972 | | | 1,746,972 | 12 | 5 | 856,85[illegible] | [illegible] | 8 | 2,603,829 | 7 | 1 |
| Sweden | 212,639 | 18 | 1 | 91,587 | 5 | 1 | 67,7[illegible] | [illegible] | 8 | 162,375 | 17 | 9 |
| Norway | 91,678 | 10 | 1 | 92,599 | 1 | 1 | 58,[illegible] | 5 | 6 | 150,824 | 6 | 7 |
| Denmark | 110,981 | 7 | 2 | 173,280 | 1 | 11 | 83,[illegible] | 8 | 3 | 256,703 | 10 | 2 |
| Prussia | 1,200,102 | 7 | 5 | 264,618 | 2 | 1 | 594,[illegible]84 | 12 | 10 | 829,302 | 14 | 11 |
| Germany | 201,165 | 8 | 3 | 7,667,147 | 0 | 3 | 1,80[illegible],480 | 8 | 9 | 9,473,627 | 9 | 0 |
| Netherlands | 1,276,080 | 13 | 0 | 3,179,298 | 13 | 6 | 3,2[illegible],927 | 0 | 11 | 6,450,225 | 14 | 5 |
| France | 3,056,154 | 12 | 4 | 635,927 | 13 | 5 | [illegible]6,081 | 19 | 7 | 892,009 | 13 | 0 |
| Portugal, Azores, and Madeira | 520,616 | 18 | 8 | 2,251,584 | 3 | 0 | [illegible]68,197 | 17 | 1 | 2,319,782 | 0 | 1 |
| Spain and the Canaries | 1,293,924 | 0 | 4 | 1,036,623 | 17 | 3 | 318,038 | 7 | 8 | 1,354,662 | 5 | 4 |
| Gibraltar | 19,668 | 7 | 0 | 879,282 | 3 | 7 | 121,340 | 18 | 3 | 1,000,723 | 1 | 10 |
| Italy | 1,475,304 | 6 | 10 | 4,528,154 | 10 | 4 | 820,651 | 1 | 0 | 5,318,805 | 11 | 4 |
| Malta | 63,550 | 2 | 10 | 257,537 | 8 | 8 | 20,485 | 2 | 6 | 278,022 | 11 | 2 |
| Ionian Islands | 187,185 | 11 | 4 | 71,592 | 13 | 2 | 13,383 | 8 | 7 | 84,976 | 1 | 9 |
| Turkey and Continental Greece | 759,797 | 19 | 1 | 2,113,928 | 9 | 2 | 95,777 | 3 | 2 | 2,209,705 | 12 | 4 |
| Morea and Greek Islands | 29,273 | 6 | 9 | 28,563 | 12 | 0 | 1,743 | 11 | 10 | 30,307 | 3 | 10 |
| Guernsey, Jersey, Alderney, & Man | 202,940 | 14 | 7 | 445,410 | 2 | 4 | 126,435 | 1 | 2 | 571,845 | 3 | 6 |
| Egypt, Ports on the Mediterranean | 275,547 | 19 | 7 | 236,189 | 15 | 3 | 2,068 | 9 | 9 | 238,258 | 5 | 0 |
| Tripoli, Barbary, and Morocco | 45,986 | 5 | 9 | 759 | 10 | 0 | 4,950 | 16 | 11 | 5,710 | 6 | 11 |
| W. coast of Africa | 299,105 | 0 | 5 | 352,182 | 17 | 9 | 155,275 | 19 | 7 | 507,458 | 17 | 4 |
| Cape of Good Hope | 183,481 | 14 | 2 | 351,107 | 13 | 3 | 28,940 | 6 | 1 | 380,047 | 19 | 4 |
| E. coast of Africa | 2,328 | 17 | 0 | | | | | | | | | |
| Cape Verde Islands | | | | 123 | 17 | 6 | 75 | 3 | 8 | 199 | 1 | 2 |
| St. Helena | 44,512 | 3 | 8 | 28,439 | 6 | 3 | 3,030 | 9 | 10 | 31,469 | 16 | 1 |
| Mauritius | 724,285 | 8 | 2 | 268,963 | 16 | 4 | 11,984 | 17 | 9 | 280,948 | 14 | 1 |
| East Indies and China | 7,920,182 | 3 | 9 | 6,521,532 | 10 | 7 | 426,068 | 0 | 7 | 6,947,600 | 11 | 2 |
| New South Wales, Van Diemen's Land, and Swan River | 191,841 | 3 | 2 | 427,378 | 18 | 8 | 149,735 | 11 | 9 | 577,114 | 10 | 5 |
| New Zealand and South Sea Islan. | 6,412 | 10 | 0 | 4,056 | 12 | 6 | 815 | 8 | 3 | 4,872 | 0 | 9 |
| British Northern Colonies | 1,532,532 | 19 | 0 | 2,858,514 | 19 | 9 | 271,975 | 9 | 3 | 3,130,490 | 9 | 0 |
| British W. Indies | 8,448,839 | 8 | | 3,729,521 | 14 | 3 | 258,764 | 6 | 4 | 3,988,286 | 0 | 7 |
| Foreign do. | 615,504 | 7 | | 2,186,482 | 5 | 7 | 48,762 | 14 | 11 | 2,235,245 | 0 | 6 |
| United States | 8,970,342 | 8 | | 12,007,208 | 8 | 11 | 588,965 | 9 | 0 | 12,596,173 | 17 | 11 |
| Mexico | 160,751 | 12 | | 1,112,916 | 12 | 11 | 138,852 | 4 | 10 | 1,251,768 | 17 | 9 |
| Guatemala | 8,065 | 4 | | | | | | | | | | |
| Colombia | 25,243 | 14 | | 476,768 | 0 | 0 | 22,964 | 17 | 4 | 499,732 | 17 | 4 |
| States of the Rio de la Plata | 476,272 | 14 | 10 | 582,086 | 6 | 4 | 8,224 | 8 | 10 | 590,310 | 15 | 2 |
| Chili | 21,030 | 16 | 11 | 1,057,621 | 17 | 2 | 10,842 | 2 | 8 | 1,068,463 | 19 | 10 |
| Peru | 42,377 | 9 | 3 | 624,639 | 11 | 10 | 21,392 | 9 | 3 | 646,032 | 1 | 1 |
| Brazil | 2,278,059 | 18 | 4 | 2,392,662 | 8 | 4 | 39,002 | 8 | 7 | 2,131,664 | 16 | 11 |
| Whale Fisheries | 273,800 | 19 | 9 | | | | 1,914 | 0 | 0 | 1,914 | 0 | 0 |
| Total | £49,727,108 | 14 | | 60,686,364 | 12 | 10 | 10,745,126 | 9 | 7 | 71,431,491 | 2 | 5 |

TABLE I.—A STATEMENT of the official value of MERCHANDISE annually imported into GREAT BRITAIN from all parts of the World, since 1700.

| Years. | East Indies and China. | British West Indies. | Ireland. | All other parts. | Total. | Amount of ustoms Duty. | Value of Gold Coined. |
|---|---|---|---|---|---|---|---|
| | | £ | £ | £ | £ | £ | £ |
| 1710 | 536,[illegible]6 | 625,112 | 282,731 | 3,309,318 | 4,753,777 | 1,340,596 | 7,524,105 |
| 1720 | 669,8[illegible] | 859,102 | 364,925 | 3,577,802 | 6,471,697 | 1,553,417 | 2,737,637 |
| 1730 | 949,12[illegible] | 1,179,505 | 327,951 | 4,325,235 | 6,781,817 | 1,628,458 | 10,511,953 |
| 1740 | 990,474 | 1,383,778 | 368,947 | 4,735,013 | 7,478,212 | 1,532,092 | 2,691,626 |
| 1750 | 952,927 | [illegible],257,098 | 589,855 | 4,489,703 | 7,289,582 | 1,297,844 | 8,725,921 |
| 1760 | 987,511 | 1,[illegible]3,234 | 705,411 | 5,261,827 | 8,647,983 | 1,716,306 | 11,662,216 |
| 1770 | 1,464,562 | 2,4[illegible]000 | 1,119,747 | 6,769,779 | 11,799,094 | 2,207,584 | 8,419,390 |
| 1771 | 1,882,165 | 2,93[illegible]4 | 1,554,708 | 7,839,927 | 14,208,324 | 2,642,129 | *637,796 |
| 1772 | 2,473,152 | 3,[illegible] | 1,382,649 | 7,247,787 | 14,508,719 | 2,525,596 | 843,853 |
| 1773 | 1,933,096 | 2,[illegible] | 1,378,666 | 6,374,788 | 12,522,643 | 2,439,007 | 1,317,645 |
| 1774 | 1,386,984 | 3,561,[illegible] | 1,602,242 | 7,927,373 | 14,477,876 | 2,567,770 | 4,685,624 |
| 1775 | 1,091,845 | 3,627,881 | 1,624,020 | 8,472,623 | 14,815,855 | 2,481,031 | 4,901,219 |
| 1776 | 1,468,077 | 3,300,644 | 1,653,511 | 6,217,197 | 12,439,429 | 2,480,403 | 5,006,398 |
| 1777 | 1,834,221 | 2,791,928 | [illegible],653,032 | 6,369,653 | 12,648,834 | 2,229,406 | 3,680,995 |
| 1778 | 1,526,130 | 3,010,930 | [illegible]482,157 | 4,956,325 | 10,975,532 | 2,162,681 | 350,438 |
| 1779 | 716,323 | 2,830,560 | [illegible]47,179 | 6,442,950 | 11,537,012 | 2,502,274 | 1,696,117 |
| 1780 | 970,726 | 2,605,910 | [illegible]3,417 | 5,491,187 | 10,812,240 | 2,723,920 | ——— |
| 1781 | 2,526,339 | 1,858,537 | 1,[illegible]9,522 | 6,709,215 | 12,723,613 | 2,791,428 | 876,794 |
| 1782 | 626,319 | 2,506,251 | 1,4[illegible],420 | 5,720,858 | 10,341,828 | 2,861,563 | 698,074 |
| 1783 | 1,301,495 | 2,891,895 | 1,61[illegible]904 | 7,316,941 | 13,122,235 | 2,848,320 | 227,083 |
| 1784 | 2,996,652 | 3,405,120 | 1,77[illegible]84 | 7,093,121 | 15,272,877 | 3,326,639 | 822,126 |
| 1785 | 2,703,940 | 4,354,421 | 2,012[illegible]88 | 7,208,750 | 16,279,399 | 4,592,091 | 2,488,106 |
| 1786 | 3,156,687 | 3,143,390 | 2,170[illegible]64 | 7,015,031 | 15,786,072 | 4,076,911 | 1,107,382 |
| 1787 | 3,430,868 | 3,783,289 | 2,221,728 | 8,368,149 | 17,804,024 | 3,673,807 | 2,849,056 |
| 1788 | 3,453,897 | 4,088,453 | 2,184,964 | 8,299,896 | 18,027,170 | 3,780,770 | 3,664,174 |
| 1789 | 3,350,148 | 3,906,404 | 2,401,786 | 8,159,864 | 17,821,202 | 3,357,000 | 1,530,711 |
| 1790 | 3,149,770 | 3,890,927 | 2,573,747 | 9,516,442 | 19,130,886 | 3,764,483 | 2,660,521 |
| 1791 | 3,698,713 | 3,691,038 | 2,479,269 | 9,800,752 | 19,669,782 | 3,925,386 | 2,456,566 |
| 1792 | 2,671,547 | 4,183,066 | 2,622,733 | 10,182,012 | 19,659,358 | 3,988,591 | 1,171,863 |
| 1793 | 3,499,023 | 4,392,158 | 2,284,920 | 9,080,636 | 19,256,717 | 3,947,372 | 2,747,430 |
| 1794 | 4,458,475 | 4,782,616 | 2,749,900 | 10,297,903 | 22,288,894 | 3,521,230 | 2,558,895 |
| 1795 | 5,760,795 | 4,099,291 | 2,636,705 | 10,239,898 | 22,736,689 | 3,535,184 | 493,416 |
| 1796 | 3,372,689 | 3,966,763 | 2,764,879 | 13,082,988 | 23,187,319 | 3,612,725 | 464,680 |
| 1797 | 3,942,384 | 4,309,164 | 3,113,585 | 9,648,873 | 21,013,956 | 4,055,608 | 2,000,297 |
| 1798 | 7,626,930 | 5,418,541 | 2,735,686 | 12,076,732 | 27,857,889 | 5,570,676 | 2,967,565 |
| 1799 | 4,284,805 | 6,161,504 | 2,770,731 | 13,620,392 | 26,837,432 | 7,498,615 | 449,962 |
| 1800 | 4,942,275 | 7,369,287 | 2,312,824 | 15,946,219 | 30,570,605 | 6,763,298 | 189,837 |
| 1801 | 5,424,441 | 8,435,795 | 2,360,289 | 16,575,032 | 32,795,557 | 5,871,201 | 450,240 |
| 1802 | 5,794,906 | 8,531,175 | 3,133,945 | 13,983,292 | 31,442,318 | 6,058,627 | 437,019 |
| 1803 | 6,349,294 | 6,132,001 | 2,887,923 | 12,683,246 | 27,992,464 | 7,179,621 | 596,445 |
| 1804 | 5,214,842 | 7,681,646 | 2,747,209 | 13,657,793 | 29,201,490 | 8,355,871 | 718,397 |
| 1805 | 6,072,313 | 6,720,444 | 3,010,609 | 14,341,262 | 30,344,628 | 9,084,458 | 54,615 |
| 1806 | 3,755,395 | 8,815,329 | 3,281,428 | 12,983,754 | 28,835,907 | 9,733,814 | 405,105 |
| 1807 | 3,401,700 | 7,980,000 | 3,527,813 | 13,975,144 | 28,854,658 | 9,207,735 | ——— |
| 1808 | 5,853,450 | 8,777,963 | 3,968,400 | 11,029,530 | 29,629,353 | 8,797,823 | 371,774 |
| 1809 | 3,366,343 | 7,703,452 | 3,602,117 | 19,100,495 | 33,772,409 | 10,289,807 | 298,946 |
| 1810 | 4,709,870 | 8,258,173 | 3,522,840 | 24,655,254 | 41,136,135 | 10,819,151 | 316,935 |
| 1811 | 4,106,300 | 8,452,287 | 3,385,675 | 12,682,328 | 28,626,580 | 9,436,322 | 312,261 |
| 1812 | 5,602,358 | 7,487,314 | 3,671,504 | 11,834,250 | 28,595,426 | 10,029,747 | 519,722 |
| 1814 | 6,304,096 | 8,496,850 | 3,939,017 | 17,729,825 | 36,559,788 | 10,960,777 | ——— |
| 1815 | 8,042,292 | 8,527,020 | 4,167,597 | 15,242,731 | 35,989,650 | 10,526,704 | ——— |
| 1816 | 8,312,591 | 7,546,842 | 3,730,644 | 10,515,601 | 30,105,678 | 8,396,236 | ——— |
| 1817 | 7,687,328 | 8,021,203 | 4,054,729 | 14,201,972 | 33,965,232 | 9,807,901 | 4,275,337 |
| 1818 | 7,342,800 | 8,347,235 | 4,290,612 | 20,151,305 | 40,135,952 | 10,034,749 | 2,862,374 |
| 1819 | 7,544,462 | 7,887,670 | 3,944,101 | 14,249,510 | 33,625,748 | 9,388,510 | 3,574 |
| 1820 | 7,567,678 | 8,011,335 | 4,999,342 | 15,936,210 | 36,514,564 | 8,660,803 | 949,516 |
| 1821 | 6,256,210 | 7,977,835 | 6,028,496 | 15,535,075 | 35,797,617 | 9,145,110 | 9,520,760 |
| 1122 | 5,123,000 | 7,691,388 | 4,873,610 | 16,617,972 | 34,305,985 | 10,663,617 | 5,356,787 |
| 1823 | 6,918,540 | 7,971,146 | 5,871,000 | 19,654,562 | 40,415,248 | 10,406,438 | 759,748 |
| 1824 | | | 5,588,146 | | 41,729,486 | 10,239,740 | 4,065,075 |

* The Statement of Gold coined prior to 1771 includes the entire quantity in each reign, since the Restoration of Charles II. in 1663.

TABLE II.—A STATEMENT of the Official Value of MERCHANDISE annually exported from GREAT BRITAIN to all parts of the World, since 1700. Showing also the proportion of Colonial and Foreign produce in each year since 1783; and tons of shipping cleared outwards in each year since 1770.

| Years. | East Indies and China. | British West Indies. | Ireland. | All other parts. | Total. | Proportion of Colonial & Foreign produce Re-exported. | Tons of Shipping cleared Outwards. |
|---|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ | |
| 1710 | 100,422 | 298,040 | 246,378 | 5,452,288 | 6,097,128 | | |
| 1720 | 97,941 | 303,117 | 344,325 | 6,273,886 | 6,919,179 | | |
| 1730 | 107,310 | 298,569 | 469,135 | 6,902,100 | 7,771,115 | | |
| 1740 | 193,353 | 258,608 | 657,956 | 7,947,289 | 9,057,196 | | |
| 1750 | 465,992 | 421,984 | 803,428 | 8,439,287 | 10,130,991 | | |
| 1760 | 736,358 | 741,850 | 1,095,603 | 10,173,928 | 12,447,639 | | |
| 1770 | 1,045,986 | 1,146,028 | 1,947,645 | 11,565,603 | 15,705,26[illegible] | | 682,754 |
| 1771 | 1,184,824 | 1,214,167 | 2,416,186 | 14,203,303 | 19,018,48[illegible] | | 942,448 |
| 1772 | 941,361 | 1,440,127 | 2,168,692 | 13,169,988 | 17,720,1[illegible] | | 996,561 |
| 1773 | 845,707 | 1,335,773 | 2,227,648 | 11,966,302 | 16,375,4[illegible]0 | | 931,987 |
| 1774 | 546,213 | 1,418,814 | 2,347,897 | 12,975,562 | 17,288,[illegible]86 | | 877,884 |
| 1775 | 1,040,642 | 1,717,229 | 2,452,672 | 11,115,820 | 16,32[illegible],363 | | 956,606 |
| 1776 | 726,398 | 1,604,535 | 2,458,119 | 9,966,651 | 14,7[illegible],703 | | 946,331 |
| 1777 | 785,825 | 1,256,636 | 2,200,689 | 9,248,880 | 13,[illegible],030 | | 932,855 |
| 1778 | 1,199,827 | 1,151,068 | 2,816,633 | 7,091,367 | 12,[illegible]8,895 | | 826,336 |
| 1779 | 703,191 | 1,166,725 | 2,639,954 | 9,028,705 | 1[illegible]38,575 | | 792,021 |
| 1780 | 1,116,341 | 1,751,827 | 2,284,384 | 7,496,064 | 1[illegible]648,615 | | 885,137 |
| 1781 | 595,131 | 1,024,447 | 2,072,777 | 7,649,961 | [illegible],342,296 | | 679,094 |
| 1782 | 1,467,844 | 1,271,981 | 1,917,072 | 8,360,493 | [illegible]3,017,390 | | 851,512 |
| 1783 | 701,473 | 1,796,982 | 2,430,473 | 10,539,358 | [illegible]5,468,287 | | 1,039,045 |
| 1784 | 730,858 | 1,370,066 | 1,634,770 | 11,998,570 | [illegible]5,734,062 | 3,846,434 | 1,050,487 |
| 1785 | 1,153,532 | 1,235,528 | 2,168,914 | 11,559,975 | 16,117,649 | 5,035,358 | 1,236,219 |
| 1786 | 2,242,038 | 1,336,063 | 1,961,789 | 10,766,176 | 16,305,866 | 4,475,493 | 1,327,449 |
| 1787 | 1,551,209 | 1,733,265 | 2,342,543 | 11,242,772 | 16,869,789 | 4,815,890 | 1,349,420 |
| 1788 | 1,430,633 | 1,766,454 | 2,424,901 | 11,850,260 | 17,472,248 | 4,747,518 | 1,340,689 |
| 1789 | 1,957,177 | 1,763,937 | 2,314,562 | 13,304,872 | 19,340,548 | 5,561,043 | 1,611,333 |
| 1790 | 2,386,320 | 1,986,201 | 2,265,769 | 13,481,831 | 20,129,121 | 5,199,037 | 1,548,207 |
| 1791 | 2,272,066 | 2,649,066 | 2,470,463 | 15,340,400 | 22,731,995 | 5,921,976 | 1,696,023 |
| 1792 | 2,437,887 | 2,922,119 | 2,372,867 | 17,172,427 | 24,905,200 | 6,130,349 | 1,739,300 |
| 1793 | 2,721,793 | 2,695,220 | 1,943,325 | 13,029,842 | 20,390,170 | 5,784,417 | 1,357,234 |
| 1794 | 2,924,829 | 3,632,762 | 2,480,476 | 17,710,016 | 26,748,083 | 8,386,043 | 1,600,817 |
| 1795 | 2,382,033 | 2,460,888 | 2,608,464 | 19,819,168 | 27,270,553 | 8,509,126 | 1,527,597 |
| 1796 | 2,377,376 | 3,223,268 | 2,895,445 | 19,529,979 | 28,026,068 | 8,923,848 | 1,733,074 |
| 1797 | 2,288,115 | 3,144,363 | 2,431,554 | 18,451,381 | 26,315,713 | 9,412,610 | 1,501,052 |
| 1798 | 1,145,736 | 5,198,369 | 2,972,941 | 20,972,983 | 30,290,029 | 10,657,476 | 1,684,900 |
| 1799 | 2,436,373 | 5,947,427 | 2,082,720 | 23,186,829 | 33,640,357 | 9,556,144 | 1,717,325 |
| 1800 | 2,860,397 | 4,087,112 | 3,738,502 | 27,434,108 | 38,120,120 | 13,815,838 | 2,130,322 |
| 1801 | 2,946,257 | 4,385,505 | 2,947,346 | 27,489,715 | 37,768,823 | 12,008,635 | 2,150,501 |
| 1802 | 2,929,816 | 3,925,613 | 3,538,642 | 31,017,895 | 41,411,966 | 14,437,952 | 2,087,789 |
| 1803 | 2,733,013 | 2,380,203 | 3,363,256 | 23,962,023 | 31,438,495 | 9,323,257 | 2,019,382 |
| 1804 | 1,766,268 | 4,281,735 | 3,380,258 | 25,023,106 | 34,451,367 | 10,515,574 | 2,051,135 |
| 1805 | 1,669,215 | 3,832,430 | 3,758,054 | 25,048,846 | 34,308,545 | 9,950,508 | 1,900,609 |
| 1806 | 1,936,954 | 4,733,815 | 3,543,082 | 26,313,334 | 36,527,184 | 9,124,479 | 2,053,713 |
| 1807 | 1,884,437 | 4,578,877 | 3,978,487 | 24,124,770 | 34,566,571 | 9,395,283 | 2,050,013 |
| 1808 | 1,933,223 | 5,928,769 | 4,597,638 | 22,094,637 | 34,554,267 | 7,863,204 | 1,654,944 |
| 1809 | 1,647,627 | 5,975,127 | 4,619,686 | 38,044,460 | 50,286,900 | 15,194,334 | 2,230,902 |
| 1810 | 1,717,118 | 4,790,143 | 3,212,016 | 36,149,582 | 45,869,859 | 10,945,313 | 2,862,801 |
| 1811 | 1,664,522 | 4,122,920 | 4,568,418 | 22,053,812 | 32,409,671 | 8,279,698 | 2,203,585 |
| 1812 | 1,779,212 | 4,767,311 | 5,262,197 | 31,434,453 | 43,243,173 | 11,998,179 | 2,206,420 |
| 1814 | 1,699,125 | 6,315,073 | 4,265,831 | 44,354,200 | 55,624,229 | 20,499,347 | 2,447,298 |
| 1815 | 2,093,464 | 6,915,989 | 3,557,873 | 48,415,737 | 60,983,063 | 16,930,439 | 2,759,720 |
| 1816 | 2,204,978 | 4,607,589 | 3,025,527 | 41,422,371 | 51,260,467 | 14,545,933 | 2,317,736 |
| 1817 | 2,794,634 | 6,762,069 | 3,620,453 | 39,946,036 | 53,123,202 | 11,534,616 | 2,645,370 |
| 1818 | 3,195,826 | 5,784,553 | 4,061,572 | 43,815,976 | 56,857,927 | 12,287,275 | 3,072,409 |
| 1819 | 2,421,764 | 4,490,010 | 4,072,181 | 35,951,151 | 46,935,105 | 11,278,077 | 2,754,055 |
| 1820 | 3,390,397 | 4,352,513 | 3,387,794 | 46,601,910 | 51,733,113 | 11,490,340 | 2,598,654 |
| 1821 | 4,427,331 | 5,069,372 | 4,285,641 | 41,301,178 | 55,083,522 | 11,971,150 | 2,575,152 |
| 1822 | 4,100,693 | 4,146,463 | 4,192,718 | 44,523,260 | 56,963,134 | 10,510,521 | 2,695,130 |
| 1823 | 4,355,438 | 4,622,805 | 4,501,386 | 42,755,219 | 56,234,663 | 9,948,372 | 2,610,787 |
| 1824 | | | 5,006,639 | | 63,225,272 | 11,506,665 | 3,182,776 |

TABLE III.—STATEMENTS, exhibiting the total Official Value of MERCHANDISE annually Imported Into, and Exported from GREAT BRITAIN, to and from all parts of the World since 1700. Showing I. the proportion to and from the EAST INDIES and CHINA, British Colonies in the WEST INDIES, and SOUTH AMERICA, and IRELAND (Vide—the three first columns in each of the two preceding Statements); and II. the proportion to and from all other parts of the WORLD (Vide—the fourth column in each of the two preceding Statements.)

| Years. | Imported. | Exported. | Excess of Import. | Exported. | Imported. | Excess of Export. |
|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | £ |
| 1710 | 1,244,4[illegible]9 | 644,840 | 599,619 | 5,452,288 | 3,309,318 | 2,142,970 |
| 1720 | 1,893,89[illegible] | 745,293 | 1,148,600 | 6,273,886 | 3,577,802 | 2,696,084 |
| 1730 | 2,456,582 | 875,014 | 1,581,568 | 6,902,100 | 4,325,235 | 2,576,865 |
| 1740 | 2,743,200 | [illegible],109,907 | 1,633,292 | 7,947,289 | 4,735,013 | 3,212,276 |
| 1750 | 2,799,880 | [illegible],691,414 | 1,108,476 | 8,439,287 | 4,489,703 | 3,949,584 |
| 1760 | 3,386,156 | [illegible]73,711 | 812,445 | 10,173,928 | 5,261,827 | 4,912,101 |
| 1770 | 5,029,315 | 4,[illegible]39,659 | 889,656 | 11,565,603 | 6,769,779 | 4,795,824 |
| 1771 | 6,368,397 | 4,8[illegible]5,177 | 1,553,220 | 14,203,303 | 7,839,827 | 6,363,376 |
| 1772 | 7,260,928 | 4,55[illegible],180 | 2,710,748 | 13,169,988 | 7,247,787 | 5,922,201 |
| 1773 | 6,147,855 | 4,40[illegible],128 | 1,738,727 | 11,966,302 | 6,374,788 | 5,591,514 |
| 1774 | 6,550,493 | 4,312,[illegible]24 | 2,237,569 | 12,975,562 | 7,927,383 | 5,048,179 |
| 1775 | 6,343,746 | 5,210,[illegible]5 | 1,133,203 | 11,115,820 | 8,472,623 | 2,743,197 |
| 1776 | 6,422,232 | 4,789,[illegible] | 1,633,180 | 9,966,651 | 6,217,197 | 3,749,454 |
| 1777 | 6,279,181 | 4,243,1[illegible] | 2,036,031 | 9,248,880 | 6,369,653 | 2,879,227 |
| 1778 | 6,019,217 | 5,167,52[illegible] | 851,689 | 7,091,367 | 4,956,325 | 2,135,042 |
| 1779 | 5,094,062 | 4,509,870 | 684,192 | 9,028,705 | 6,442,950 | 2,585,855 |
| 1780 | 5,320,053 | 5,152,552 | 167,501 | 7,496,064 | 5,491,187 | 2,004,877 |
| 1781 | 6,014,398 | 3,692,335 | 2,352,063 | 7,649,961 | 6,709,215 | 2,940,746 |
| 1782 | 4,620,970 | 4,656,897 | — 35,927 | 8,360,493 | 5,720,858 | 2,639,635 |
| 1783 | 5,805,294 | 4,928,928 | 876,366 | 10,539,359 | 7,316,941 | 3,222,418 |
| 1784 | 8,179,786 | 3,735,492 | 4,444,364 | 11,998,570 | 7,093,120 | 4,905,450 |
| 1785 | 9,070,649 | 4,557,674 | 4,512,975 | 11,559,975 | 7,208,750 | 4,351,225 |
| 1786 | 8,771,041 | 5,539,690 | 3,231,351 | 10,776,176 | 7,015,031 | 3,751,145 |
| 1787 | 9,435,875 | 5,627,017 | 3,808,858 | 11,242,775 | 8,368,149 | 2,874,623 |
| 1788 | 9,727,274 | 5,621,988 | 4,105,285 | 11,850,260 | 8,299,896 | 3,550,354 |
| 1789 | 9,661,338 | 6,035,676 | 3,625,662 | 13,304,873 | 8,159,864 | 5,145,008 |
| 1790 | 9,614,444 | 6,638,290 | 2,976,154 | 13,481,831 | 9,516,442 | 3,965,389 |
| 1791 | 9,869,030 | 7,391,595 | 2,477,435 | 15,340,400 | 9,800,752 | 5,539,648 |
| 1792 | 9,477,346 | 7,732,873 | 1,744,473 | 17,172,427 | 10,182,012 | 6,990,415 |
| 1793 | 10,176,181 | 7,360,338 | 2,815,743 | 13,029,842 | 9,080,636 | 3,949,209 |
| 1794 | 11,990,991 | 9,038,067 | 2,952,924 | 17.710,016 | 10,297,903 | 7,412,113 |
| 1795 | 12,496,791 | 7,451,385 | 5,045,406 | 19,819,168 | 10,239,898 | 9,579,270 |
| 1796 | 10,104,331 | 8,496,088 | 1,708,242 | 19,529,978 | 13,082,988 | 6,446,991 |
| 1797 | 11,365,083 | 7,864,332 | 3,500,751 | 18,451,381 | 9,648,873 | 8,802,508 |
| 1798 | 15,781,157 | 9,317,056 | 6,464,111 | 20,973,000 | 12,076,732 | 8,896,251 |
| 1799 | 13,217,040 | 10,467,528 | 2,749,512 | 23,186,830 | 13,620,392 | 9,566,437 |
| 1800 | 14,624,386 | 10,686,012 | 3,938,374 | 27,434,107 | 15,946,220 | 11,487,889 |
| 1801 | 16,220,525 | 10,279,108 | 5,941,417 | 27,489,715 | 16,575,032 | 10,914,682 |
| 1802 | 17,459,025 | 10,394,071 | 7,054,955 | 31,017,895 | 13,983,292 | 17,034,603 |
| 1803 | 15,309,218 | 8,476,472 | 6,832,745 | 23,962,023 | 12,683,246 | 11,278,777 |
| 1804 | 15,643,697 | 9,428,261 | 6.215,436 | 25,023,105 | 13,657,793 | 11,365,313 |
| 1805 | 15,803,365 | 9,259,700 | 6,543,667 | 25,048,845 | 14,341,258 | 10,707,584 |
| 1806 | 15,852,153 | 10,213,851 | 5,638,302 | 26,313,384 | 12,983,754 | 13,329,580 |
| 1807 | 14,909,514 | 10,441,801 | 4,467,713 | 24,124,770 | 13,975,144 | 9,149,625 |
| 1808 | 18,599,823 | 12,459,630 | 6,140,193 | 22,094,637 | 11,029,530 | 11,065,107 |
| 1809 | 14,671,912 | 12,242,440 | 2,429,472 | 38,044,460 | 19,100,495 | 18,943,965 |
| 1810 | 16,480,881 | 9,720,277 | 6,760,604 | 36,149,582 | 24,655,254 | 11,494,338 |
| 1811 | 15,944,262 | 10,355,859 | 5,588,303 | 22,053,812 | 12,682,328 | 9,371,484 |
| 1812 | 16,761,175 | 11,808,720 | 4,952,455 | 31,434,453 | 11,834,250 | 19,600,103 |
| 1814 | 18,829,963 | 12,270,030 | 6,559,934 | 44,354,200 | 17,729,825 | 26,624,375 |
| 1815 | 20,736,910 | 12,567,326 | 8,169,583 | 48,415,737 | 15,242,731 | 33.173,006 |
| 1816 | 19,590,077 | 9,838,094 | 9,752,983 | 41,422,373 | 10,515,601 | 30,906,772 |
| 1817 | 19,763,260 | 13,177,166 | 6,586,094 | 39,946,036 | 14,201,972 | 25,744,064 |
| 1818 | 19,984,647 | 13,041,951 | 6,942,696 | 43,815,976 | 20,151,305 | 23,664,671 |
| 1819 | 19,376,231 | 10,983,955 | 8,392,276 | 35,951,150 | 14,249,510 | 21,701,640 |
| 1820 | 20,578,355 | 11,131,104 | 9,447,151 | 40,601,910 | 15,936,210 | 24,665,700 |
| 1821 | 20,262,541 | 13,782,344 | 6,480,198 | 41,501,178 | 15,535,075 | 25,966,103 |
| 1822 | 17,688,013 | 12,439,894 | 5,248,139 | 44,523,260 | 16,617,972 | 27,905,290 |

The following Statement, extracted from the Custom-House Report, also ordered to be printed by the House of Commons, on the 2d of April, 1819, shows the amount of the shipping belonging to the British empire, with the exception of SCOTLAND and IRELAND (for which see those articles) with their tonnage, and the number of men and boys usually employed in navigating them. On the 30th of September of the three following years, these were,

| | 1816 | | | 1817 | | | 1818 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Vessels. | Tons. | Men. | Vessels. | Tons. | Men. | Vessels. | Tons. | Men. |
| England . . | 17,442 | 2,152,968 | 134,060 | 17,082 | 2,077,338 | 127,749 | [illegible]64 | 2,080,416 | 129,389 |
| Isle of Guernsey | 65 | 7,237 | 494 | 63 | 6,758 | 446 | 65 | 7,776 | 510 |
| —— Jersey . | 77 | 7,992 | 636 | 79 | 8,167 | 58[illegible] | 85 | 8,967 | 636 |
| —— Man . | 369 | 9,335 | 2,315 | 343 | 8,764 | 2,1[illegible] | 348 | 8,896 | 2,449 |
| Brit. Plantations | 3,775 | 279,643 | 16,859 | 3,571 | 243,632 | 15,[illegible] | 3,483 | 221,860 | 15,121 |
| Total | 21,728 | 2,457,175 | 154.364 | 21,138 | 544,659 | 146,[illegible]10 | 21,145 | 2,327,915 | 148,105 |

An Account of the number of Vessels, with the amount of their tonnage, that belonged to the several Ports of the British Empire on the 31st December, 1829, 1830, and 1831 respectively.

| | 1829. | | 1830. | | 1831. | |
|---|---|---|---|---|---|---|
| | Vessels | Tons. | Vessels | Tons. | Vessels | Tons. |
| United Kingdom . . . | 18,618 | 2,168,3[illegible] | [illegible],675 | 2,168,916 | 18,942 | 2,190,457 |
| Isles of Guernsey, Jersey, and Man | 492 | | 499 | 32,676 | 508 | 33,899 |
| British Plantations . . . | 4,343 | | 4,547 | 330,227 | 4,792 | 357,608 |
| Total . . . . | 23,453 | 2,517,000 | 23,721 | 2,531,819 | 24,242 | 2,581,964 |

Vessels employed in foreign trade.—In the year 1831 there were entered inwards in the Ports of the United Kingdom 14,488 British ships (2,367,322 tons, employing 131,627 men, and 6085 Foreign vessels (874,605 tons), employing 47,453 men; and there cleared out in the same period 13,791 British ships (2,300,731 tons), employing 132,004 men, and 5927 Foreign ships (896,051 tons, employing 47,009 men.

The *government* of England is that of her universal and vast empire:—a mixed monarchy, consisting of the KING, who has the prerogative of convening, proroguing, and dissolving parliament; creating peers; assenting to, or rejecting, all bills that pass the houses of lords and commons; appointing every member of the magistracy and executive government, together with the bishops of the established church; and who has the supreme command of the army and navy: the house of PEERS, consisting of the lords spiritual and temporal, the English temporal peers having an hereditary right to sit in the house (but an election being made of Scottish and Irish peers), and their number, therefore, being limited by no existing law: and the house of COMMONS, elected by the people under the four denominations of knights, citizens, burgesses, and barons. The English peers amount to about 400; and the members of the house of commons for England, to 471; but while we now write (April 1832) a bill has passed through the Commons and been read a first time in the House of Lords which diminishes the amount See ELECTION.

The house of commons is distinguished from that of the peers by the right of originating or levying the taxes, and the election of its own members, who are the constitutional guardians of the public purse; and who, therefore, never suffer the lords to make any alteration in money bills.

Bills, which have passed both houses (for they are so denominated throughout their several stages in each), receive the royal assent, and become *Acts of Parliament*, constituting the statute law of the land. Bills of a general description may originate in either house, and are transmitted to the other for discussion, where they may either be altered or entirely rejected. When altered, the amendments must be communicated to the house in which the bill originated, for approbation; and having passed both houses, no further alteration can take place. The royal assent must be then given to it in the state in which it is presented, or withheld altogether. See ASSENT. An act of parliament thus made is 'of the highest earthly authority which this kingdom acknowledges. It has power to bind every subject in the King's dominions, and even the king himself, if particularly named therein. It cannot be altered, amended, dispensed with, suspended, or repealed, but by the same forms, and by the same authority of parliament which gave it existence.' For more minute particulars of the privileges and duties of PARLIAMENT, see that article; for those of the Courts of Law, see COURT and LAW.

The king, by his judges, is not only supposed to be present in all the courts when they assemble; but for the more perfect conservation of the public peace, he is represented at all times, constitutionally, by his *sheriff* of each county. 'As the keeper of the king's peace,' says Mr. Justice Blackstone, 'the sheriff is the first man in the county, and superior in rank to any nobleman

therein, during his office. He may apprehend, and commit to prison, all persons who break the peace, or attempt to break it, and may bind any one in a recognizance to keep the king's peace. He may, and is bound ex-officio, to pursue and take all traitors, murderers, felons, and other misdoers, and commit them to gaol for safe custody. He is also to defend his county against any of the king's enemies, when they come into the land; and for this purpose, as well as for keeping the peace and pursuing felons, he may command all the people of his county to attend him, which is called the posse comitatus, or power of the county; which summons every person above fifteen years of age, and under the degree of a peer, is bound to attend upon warning, on pain of fine and imprisonment. Yet he cannot exercise the office of a justice of the peace, for then this inconvenience would arise, that he should command himself to execute his own precepts.'—1 *Commentaries*, 3[illegible].

Juries, justices of the peace, of which several are put in commission for each county, the coroner, and the constable, complete the general outline of our legal authorities. The duty of the justice of the peace is very general and constant; he is to put the greater part of the statute law in execution, to take charge of highways, the poor, vagrants, treason, felonies, riots, the preservation of game, &c.; and examine and commit to prison all who disturb the peace, or disquiet the king's subjects, removing them to the county gaol for trial at the sessions, held quarterly before the united justices of the county, or at the next county assizes, for trial before the judge of assize, according to the offence. See CORONER and CONSTABLE.

The trial by jury is considered one of the most decided features of the triumph of liberty and intelligence in the executive branch of our constitution. Twelve respectable men of the county, or neighbourhood, where a crime is committed, and who are best qualified for the office, are constituted the judges both of the law in its application, and of the entire facts of every criminal case. When a man is charged with any capital offence, and committed to the county gaol by the magistrates of the district, the charge must first be examined by the GRAND JURY, whose province it is to ascertain if there be sufficient grounds for exposing the person accused to a public trial; for, in the eye of the law, he is considered innocent till it be fully proved to the contrary. Unless a bill of indictment therefore be found against the prisoner, by a majority of this jury, he is immediately discharged, and can never be again indicted for the same offence.

In proceeding to a trial, the person accused is furnished with a list of the PETTY JURY, as it is called, who are to be his final judges, and is allowed in open court to object to any against whom he can assign reasons for their not being admitted, until twelve unexceptionable men are found; and, in order to secure all possible impartiality in the trial, if the person indicted be a foreigner, half the jury are also to be foreigners, if the accused person so desire. They are then sworn that they shall well and truly try, and deliverance make between the king and the prisoner whom they shall have in charge, according to the evidence. On these juries the prisoner rests his cause, and the verdict they pronounce is final. After they have heard the evidence, the prisoner's defence, the comments of the judge on the testimony given, his exposition of the nature of the crime, and the bearings of the law upon it, under every possible aspect, they are confined, without meat, drink, or candle, till the whole are unanimous in acquitting or condemning the prisoner. Trial by jury, as thus constituted, is evidently one of the greatest bulwarks of our freedom. It remains only to be completed by the allowance of counsel to a prisoner in every case. If one of the jury die, while they are locked up, the prisoner is acquitted. This institution has been selected for imitation by all the modern states who have asserted their liberty.

The greatest crime known to the English law is *high treason*, and it is accordingly punished with peculiar severity. The several offences which come under that denomination were limited, by the statute 25th Edw. III., t[illegible] distinct branches, of which, the compassing and imagining the king's death, and the conspiring to levy war against his authority, were the principal. Other treasons have since been added, relating to papists, falsifying the coin, or other royal signatures, and for the security of the protestant succession in the house of Hanover. Two new treasons were created during the late reign (36 Geo. III. ch. 7), viz. that of compassing and imagining to depose the king, and conspiring to levy war to force the crown to change its measures and its councils. The sentence of the law against this offence is, that the offender shall be hanged, drawn, and quartered; and forfeit his lands and goods to the king. The humanity of modern times, however, has dispensed with the literal application of this punishment. Persons convicted of high treason are first hung till they are dead, they are then taken down and decapitated, and the drawing and quartering are wholly disused.

*Petty treason* is when a wife murders her husband, a servant his master or mistress, an ecclesiastic a prelate, or one to whom he owes obedience, the punishment for which is, to be drawn on a sledge to the gallows and hange[d]. Felony includes murder, robbery, forging, maiming, or stabbing with a sharp instrument, &c.; for all which the law awards the sentence of death; a circumstance to which much attention has been of late excited. Some amelioration of these severe enactments are already accomplished; others are said to be intended by the executive. See LAW. Murderers are executed within forty-eight hours from the passing of the sentence, and their bodies dissected. The sentence for robbery, unless attended with circumstances of brutality, is frequently commuted for either transportation, or imprisonment on board the hulks. Fines, imprisonment with hard labor, pillory, and whipping, are the chief punishments assigned by the law for minor offences.

We are indebted to Mr. Capper's Topographical Account of England and Wales for the following

**Statement** exhibiting the counties of **England** and **Wales**, arranged in order of their legal jurisdiction, with the numerical ratio of their total population; the number of divisional meetings or petty sessions, and of acting magistrates in each county.

| | COUNTIES. | Num. Ratio of Total Population | No. of Petty Sessions. | No. of acting Magistrates. |
|---|---|---|---|---|
| | Middlesex. | 1144 | 13 | 200 |
| OME. | Hertford . . . . | 130 | 12 | 95 |
| | Essex (*Chelmsford*) | 245 | 14 | 148 |
| | Kent (*Maidstone*) | 426 | 14 | 168 |
| | Sussex * (*Horsham*) | 233 | 16 | 134 |
| | Surrey † (*Kingston*) | 399 | 11 | 165 |
| OXFORD. | Berks ‡ (*Reading*) | 132 | 9 | 93 |
| | Oxford . . . . | 134 | 13 | 59 |
| | Worcester . . . | 184 | 13 | 90 |
| | Stafford . . . . | 342 | 8 | 62 |
| | Salop (*Shrewsbury*) | 206 | 11 | 109 |
| | Hereford . . . | 103 | 12 | 136 |
| | Monmouth . . . | 72 | 10 | 39 |
| | Gloucester . . . | 336 | 18 | 179 |
| | Northampton . . | 163 | 9 | 79 |
| | Rutland (*Oakham*) | 18 | 1 | 7 |
| | Lincoln and City . | 283 | 16 | 110 |
| | Nottingham & Town | 187 | 10 | 85 |
| | Derby . . . . | 213 | 6 | 54 |
| | Leicester & Borough | 175 | 6 | 52 |
| | City of Coventry . | 29 | | 10 |
| | Warwick . . . | 245 | 14 | 51 |
| | Hants (*Winchester*) | 282 | 11 | 110 |
| | Wilts (*Salisbury*) | 222 | 16 | 91 |
| | Dorset (*Dorchester*) | 144 | 9 | 63 |
| | Devon (*Exeter & City*) | 439 | 20 | 167 |
| ES. | Cornwall § (*Launceston*) | | 16 | 99 |
| | City of Bristol . . | 53 | | |
| | Somerset ‖ (*Taunton*) | 355 | 16 | 130 |

| | COUNTIES. | Num. Ratio of Total Population | No. of Petty Sessions. | No. of acting Magistrates. |
|---|---|---|---|---|
| | Buckingham ¶ | 134 | 10 | 136 |
| | Bedford . . | 84 | 6 | 41 |
| | Huntingdon | 49 | 3 | 22 |
| | Cambridge . | 122 | | 83 |
| | Isle of Ely ([illegible]y) . | 9 | | |
| | Norfolk ** (*Thetford*) | 341 | 33 | 154 |
| | Suffolk (*Bury St. Ed.*) | 270 | 16 | 110 |
| | York and City . . | 1176 | 52 | 251 |
| | Durham . . | 208 | 16 | 74 |
| RN. | Northumberland (*Newcastle & Town*) | 199 | | 43 |
| | Cumberland (*Carlisle*) | | 5 | 55 |
| | Westmoreland (*Appleby*) | | 4 | 32 |
| | Lancaster . . . | 1053 | 16 | 100 |
| | Chester . . . . | 270 | 8 | 79 |
| | Flint (*Mold*) . . | 55 | 7 | 24 |
| | Montgomery (*Welsh Pool*) | | 9 | 37 |
| | Denbigh (*Ruthin*) | 78 | 8 | 36 |
| WALES. | Cardigan . . . | 59 | 9 | 46 |
| | Pembroke . . | 75 | 7 | 67 |
| | Caermarthen . | 92 | 8 | 39 |
| | Haverford West | 4 | | |
| | Glamorgan (*Cardiff*) | 104 | 9 | 77 |
| | Brecon . . . . | 44 | 6 | 43 |
| | Radnor (*Preisteign*) | 23 | 6 | 21 |
| WALES. | Anglesey (*Beaumaris*) | | 4 | 22 |
| | Caernarvon . . | 5[illegible] | 5 | 31 |
| | Merioneth (*Bala Dolgelly*) | | 6 | 23 |

*** There are 183 cities and towns in England and Wales which have magistrates who lay claim to an exclusive jurisdiction, but most of them exercise only a concurrent jurisdiction with the magistrates of their respective counties, and some of them none at all. All the places holding separate assize are included in the circuits' jurisdictions. The numerical ratio of the total population of the several counties has been inserted for the purpose of more distinctly marking the ratio of crime in comparison therewith, in the respective counties. In the counties where the name of the assize town and county is different, the assize towns are inserted within a (parenthesis): where no notice is taken, the assizes are held at the town of the same name as the county, and in those marked with the following notations the Lent assizes in April are held permanently at the places inserted within the parenthesis; and the Summer assizes in August at the places affixed to their respective counties as follows, viz.—

* For Sussex, at Lewes.
† For Surrey, alternately at Guildford and Croydon.
‡ For Berks, at Abingdon.
§ For Cornwall, at Bodmin.
‖ For Somerset, alternately at Bridgewater and Wells.
¶ For Buckingham, at the town of Buckingham.
** For Norfolk, at the city of Norwich.

The king is the head of the established *church*, which in England and Wales is episcopal; and he has been styled, from the period at which our Henry VIII. assumed this title, his most sacred majesty. His ecclesiastical power is, however, rather external than universal, in the church; at least it is confined in practice to the appointment of the bishops, the disposal of livings, and the regulation of the convocation, or public synod. See Bishop.

The clergy, under the rank of archdeacon (there described), are, rectors, vicars, curates, and deacons; and these constitute the efficient part of the officers of the church. They enjoy the privileges of not being liable to fill any civil or military office; they can only be fined to the amount of their temporal estates; nor are they assessed with the rest of the inhabitants of a parish for the repairs of highways, the expenses of watching, prosecuting for robberies, &c. The whole annual income of the clergy of the church, in South Britain, has been estimated at £3,000,000. No established church has ever been more distinguished for the learn-

ing and ability of its members; or for the liberality with which its great power and political influence have been exercised with regard to other sects.

Dissenters are very numerous in England; but there is no accurate mode of estimating their total numbers. Some of their own body have suggested that one-half of the persons who regularly frequent any place of worship dissent from the establishment. They sometimes act in London in a recognised body of the three denominations of Presbyterians, Independents, and Baptists, whose ministers meet at Red Cross Street library; and are considered in their addresses to the crown, and other communications with the government, as a species of representatives of all the dissenters. But the Presbyterians rank in modern times among the smallest of the dissenting sects. The most numerous is that of the Wesleyan Methodists; next to these perhaps, including England and Wales, the Calvinistic Methodists; then the Independents, perhaps; and then the Baptists, Particular, or Calvinistic, and Arminian or General. The Friends or Quakers are it is well known not very numerous, nor increasing, the Moravians, Swedenborgians, and Unitarians are other small sects, but include many respectable individuals. For their legal situation see the article DISSENTERS.

In the *education* of the country, the established church now takes the precedence due to its station. Committees of the house of commons have also contributed in no small degree to enlighten the public mind upon this topic. The first of their Reports, dated June 1816, contains various statements of the proportion of the poor, who were then destitute of the means of instruction. In the neighbourhood of Covent Garden, the proportion was 679 uneducated out of 829. In Southwark, of 12,000 children between the age of five and fourteen, 6000 were unprovided with the means of instruction; but of all ignorant and abandoned districts, St. Giles's was found beyond comparison the worst; containing more than half the Irish in the metropolis, whose children, in number about 3000, were not only uneducated, but after the age of seven or eight trained to begging and thieving almost universally. The whole number of children in the metropolis, unprovided with education, was computed at more than 100,000, while not less than half a million of the population were equally destitute in the country.

The National Society at the period of the second Report of the committee had established but one great school, that of Baldwin's Gardens, in Gray's Inn Lane: it had contributed to the erection or enlargement of more than 200 schools, by pecuniary grants, varying from £15 to £100, and amounting in particular cases to £200, and even £300. Above 500 teachers, male and female, are trained on Dr. Bell's plan; and distributed over from 1000 to 1500 schools, containing nearly 200,000 children receiving education on this system. The majority of these have adopted Dr. Bell's plan without receiving any other aid than a supply of elementary books; the conditions on which the society furnished them being that the liturgy and catechism of the church of England should be followed, and that no religious tracts, except those sanctioned by the Society for Promoting Christian Knowledge, should be admitted into the schools. The practice of the society, however, is by no means illiberal. In regard to expense, nothing can be more gratifying than to find that, even at the highest, it does not exceed (Evidence, p. 268) 12*s.* per head per annum.

The British and Foreign School Society was found equally active and liberal according to its means, It had expended, on the laudable object of promoting instruction for the poor universally, the sum of £20,000 previously to the year 1816; of which one individual alone (who conceals his name from all parties but the treasurer) subscribed no less than £3000. Its annual expense in training male and female teachers is from £2000 to £3000 a year, and it is connected with from 400 to 500 schools whom it supplies with them throughout the kingdom. About 400,000 children are supposed, according to these reports, to receive instruction by Sunday Schools, in London.

The labors of the education committee were closed with its third Report in June 1818. They here observe that the discussion excited by the enquiry had greatly improved the administration of institutions for the education of the poor; but that much remained to be done; the efforts of private benevolence being almost entirely confined to towns, and the aid of government being wanted in the thinly peopled districts, to the extent, at least, of the purchase or erection of a school-house, leaving the annual expense to be defrayed by private subscriptions. The committee further recommend a connexion between such schools and the established church; observing that the anxiety of the poor for the education of their children, was not only unabated, but daily increasing.

A superior education is to be obtained in England by the public or grammar schools, or at the numerous and very respectable private Academies every where established. The great public schools are Eton, Harrow, Westminster, and Winchester; to which are to be added, in London, St. Paul's, Merchant Taylors' School, and the Charter-House. Here the classics are a prominent object of instruction, and while provision is made by the founders for a certain number of boys to be educated on the *foundation*, youths of the first rank join them, and pay liberally for participating the advantages of these establishments. The Universities of Oxford and Cambridge are entirely restricted to the members of the established church. A new University, designed to embrace all the religious denominations of the country, has been recently completed in the Metropolis. We give a very accurate delineation of the edifice, embracing its complete state, which a want of funds has prevented the proprietors carrying into effect.

The general charities and charitable institutions of England are also numerous and unrivalled. Amongst these, religious and moral institutions seem to claim the pre-eminence. But we cannot undertake to particularize the half of them. The most celebrated are

The Society for Promoting Christian Knowledge.
The British and Foreign Bible Society

The London Missionary Society.
The Church Missionary Society.
The Baptist Missionary Society.
The Wesleyan Missionary Society.
The National Society for the Education of the Poor.
The British and Foreign School Society.
The African Institution.
The Society for Bettering the Condition of the Poor.
The Literary Fund.

Among the principal Hospitals are,

St. Bartholomew's, West Smithfield.
Bethlem, now in St. George's Fields.
St. Luke's, Old Street.
Guy's, Southwark.
The Lock Hospital, Hyde Park-Corner.
The London Hospital, Whitechapel Road.
The Magdalen Hospital, St. George's Road.
The Middlesex Hospital, Berner's Street.
The Foundling.
The Fever Hospital.

The principal Dispensaries of the metropolis.

The General Dispensary, Aldersgate Street.
The City Dispensary.
The Finsbury Dispensary.
Thd Vaccine Institution and Dispensary.

The principal Alms-Houses are,

The Haberdashers'.
The Mercers'.
The Skinners'.
The Ironmongers'.
The East India Company's, &c.

The School Charities.

Christ's Hospital, or the Blue Coat School.
Marine Society.
School for the Indigent Blind.
Deaf and Dumb Asylum.
Debtors' Children.
Ladies' Charity School.
Masonic Charity.
Raines's Charities.

There are also three colleges or alms-houses on an enlarged scale, under a master and incorporated officers, in the neighbourhood of London, viz. Bromley, Morden, and Dulwich Colleges. We can only add, that the example of these numerous and splendid establishments of the metropolis is nobly followed up in the various county and other local hospitals, dispensaries, and public charities of every kind throughout the country. Many of the most flourishing religious institutions are aided materially by the Auxiliary Societies and associations of the provinces.

The army and navy of England at the close of the late war are thus exhibited by Dr. Colquhoun.

| | |
|---|---|
| Land forces, or men in arms in the British Empire, including the Regular Army and Foreign Corps, the British and Irish Militias, the Local Militia and Volunteers of Great Britain; with the Militia and Fencibles in the Colonies and Dependencies . . . . . . . . | 721,187 |
| Brought over . . . . . . . | 721,187 |
| Navy and Marines . . . . . . . | 179,920 |
| Native Army in India, including the India Marine Forces . . . . | 160,913 |
| Total armed Force of the British Empire . | 1,062,020 |

The peace, however, has of course reduced these establishments.

The entire amount of the regular troops, provided for by parliament in 1819, was 91,823, including 11,340 men then added, in consequence of a disturbed state of the country; but exclusive of the regiments employed in the territorial possessions of the East India Company. The whole number of seamen and marines employed at one period of the late war was taken at 184,000 men. They do not now exceed 50,000.

The revenue of Great Britain, whether we regard its past and existing resources, its encumbrances, or its future stability, is a very extensive and momentous topic of consideration. We can only advert briefly to its history and present state.

The average revenue of Great Britain, under king William III. was about £4,000,000. This was a period of difficulties and of a disputed succession, it will be remembered: under queen Anne an augmentation to £5,000,000 took place, and eventually to £6,000,000. During the reign of George I. the revenue rather exceeded £7,000,000, and a gradual increase is to be observed towards the middle of the century. The revenue during the reign of George III. is thus exhibited.

| | |
|---|---|
| 1761 it was | £8,800,000 |
| 1764 . . . | 9,250,000 |
| 1767 . . . | 9,200,000 |
| 1770 . . . | 9,510,000 |
| 1773 . . . | 10,066,661 |
| 1776 . . . | 10,265,405 |
| 1779 . . . | 11,192,141 |
| 1782 . . . | 12,593,297 |
| 1785 . . . | 14,871,520 |
| 1788 . . . | 15,572,971 |
| 1791 . . . | 16,631,000 |
| 1792 . . . | 19,382,435 |
| 1793 . . . | 17,674,395 |
| 1794 . . . | 17,440,809 |
| 1795 . . . | 17,374,890 |
| 1796 . . . | 18,243,876 |
| 1797 . . . | 18,668,925 |
| 1798 . . . | 20,518,780 |
| 1799 . . . | 23,607,945 |
| 1800 . . . | 29,604,008 |
| 1801 . . . | 28,085,829 |
| 1802 . . . | 28,221,183 |

The following is a view of the income of our government from taxes and loans since that period to 1817, and the public expenditure, during the same period. They exhibit the greatest amount of taxation ever sustained by this, or perhaps any other country, and the nature of our expenses at the same time, during unexampled periods of public exertion.

## PUBLIC INCOME OF GREAT BRITAIN IN EACH YEAR, FROM 1803 TO 1817 INCLUSIVE.

| | 1803. | 1804. | 1805. | 1806. | 1807. |
|---|---|---|---|---|---|
| Customs | £8,024,681 | 9,362,127 | 10,174,213 | 10,819,637 | 10,592,606 |
| Excise | 18,771,989 | 21,477,403 | 23,193,515 | 24,080,663 | 24,680,640 |
| Stamps | 3,326,753 | 3,518,545 | 4,062,284 | 4,278,538 | 4,401,660 |
| Land tax | 1,307,941 | 1,467,283 | 1,536,481 | 1,451,772 | 1,432,789 |
| Assessed taxes | 4,468,131 | 4,429,106 | 4,508,752 | 4,821,206 | 5,151,660 |
| Post Office | 1,256,801 | 1,277,391 | 1,424,994 | 1,490,968 | 1,472,870 |
| Crown lands, tax on pensions, &c. | 142,441 | 162,524 | 212,159 | 198,912 | 199,993 |
| Property tax | 378,326 | 3,665,063 | 4,546,883 | 6,162,558 | 10,158,007 |
| Total raised by taxes | 37,677,063 | 45,359,442 | 49,659,281 | 53,304,254 | 58,390,225 |
| Lottery, net profit | 351,507 | 432,645 | 378,648 | 496,010 | 774,694 |
| Loans, actual receipts | 11,950,000 | 13,209,251 | 25,130,404 | 19,699,263 | 15,257,211 |
| Increase of outstanding Exchequer bills | 2,611,600 | 6,185,900 | 1,926,900 | 27,100 | 7,735,400 |
| Unclaimed dividends and various receipts | 289,824 | 276,425 | 495,530 | 263,782 | 121,952 |
| Exchequer bills funded | - - | | | | |
| Total money raised | 52,879,994 | 65,463,763 | 77,590,763 | 73,790,409 | 82,279,482 |
| Deduct loan and lottery for Ireland | 2,117,444 | 3,733,291 | 3,211,062 | 1,768,000 | 3,681,251 |
| And charges of the collection of revenue | 1,955,368 | 2,135,176 | 2,257,185 | 2,375,828 | 2,699,048 |
| Total applicable to the service of Great Brit. | 48,807,182 | 59,595,296 | 72,122,516 | 69,646,581 | 75,899,183 |

| | 1808. | 1809. | 1810. | 1811. | 1812. |
|---|---|---|---|---|---|
| Customs | 10,600,776 | 12,016,451 | 12,438,243 | 11,038,148 | 11,895,195 |
| Excise | [illegible]5,592,813 | 23,470,546 | 25,796,008 | 26,078,297 | 23,531,736 |
| Stamps | 4,680,071 | 5,305,782 | 5,505,632 | 5,236,020 | 5,273,907 |
| Land tax | 1,582,732 | 1,511,550 | 1,418,337 | 1,333,432 | 1,368,128 |
| Assessed taxes | 5,915,623 | 6,840,551 | 6,233,161 | 6,006,865 | 6,091,948 |
| Post Office | 1,476,558 | 1,558,409 | 1,709,065 | 1,685,936 | 1,796,586 |
| Crown lands, tax on pensions, &c. | 276,073 | 288,202 | 76,916 | 150,276 | 72,123 |
| Property tax | 11,413,561 | 12,413,803 | 13,504,004 | 13,234,896 | 13,140,231 |
| Total raised by taxes | 61,538,207 | 63,405,294 | 66,681,366 | 64,763,870 | 63,169,854 |
| Lottery, net profit | 457,620 | 454,819 | 469,616 | 302,387 | 373,396 |
| Loans, actual receipts | 10,102,620 | 14,675,668 | 13,242,356 | 16,636,375 | 29,268,586 |
| Increase of outstanding Exchequer bills | 5,150,300 | . . . | | 3,205,500 | 3,914,600 |
| Unclaimed dividends and various receipts | 766,225 | 242,104 | 405,816 | 253,867 | 1,263,402 |
| Exchequer bills funded | 4,000,000 | 7,932,100 | 8,311,000 | 7,018,700 | 5,431,700 |
| Total money raised | 82,014,972 | 86,709,985 | 89,110,154 | 92,180,699 | 103,421,538 |
| Deduct loan and lottery for Ireland | 2,589,166 | 2,921,527 | 5,294,416 | 4,432,292 | 2,888,500 |
| And charges of the collection of revenue | 2,816,568 | 2,886,201 | 2,934,876 | 3,096,581 | 3,273,242 |
| Total applicable to the service of Great Brit. | 76,068,238 | 80,902,257 | 80,880,862 | 84,651,826 | 97,257,969 |

| | 1813. | 1814. | 1815. | 1816. | 1817. |
|---|---|---|---|---|---|
| Customs | £11,985,900 | 12,835,834 | 11,360,190 | 9,177,591 | 12,713,588 |
| Excise | 25,272,414 | 26,471,224 | 27,206,806 | 23,595,268 | 22,829,364 |
| Stamps | 5,473,409 | 5,778,579 | 6,139,585 | 6,184,289 | 7,101,767 |
| Land tax | 1,303,399 | 1,285,982 | 1,084,251 | 1,127,929 | 1,163,320 |
| Assessed taxes | 6,570,461 | 6,725,790 | 6,524,766 | 6,129,978 | 6,500,000 |
| Post Office | 1,912,114 | 2,051,929 | 1,755,898 | 1,659,855 | 1,644,929 |
| Crown lands, tax on pensions, &c. | 87,702 | 41,322 | 244,024 | 249,629 | 242,251 |
| Property tax | 14,320,436 | 14,493,532 | 14,978,557 | 12,039,157 | 2,519,416 |
| Total raised by taxes | 66,925,335 | 69,684,192 | 69,294,077 | 60,163,696 | 54,714,625 |
| Lottery, net profit | 278,666 | 356,104 | 304,652 | 234,681 | 196,689 |
| Loans, actual receipts | 35,050,574 | 36,078,047 | 39,421,959 | 8,939,800 | — |
| Increase of outstanding Exchequer bills | 2,110,400 | 10,424,900 | — | 3,208,400 | 14,000,000 |
| Unclaimed dividends and various receipts | 831,482 | 300,646 | 260,173 | 438,478 | 925,575 |
| Exchequer bills funded | 15,755,700 | | | | |
| Total money raised | 120,952,65[illegible] | 116,843,889 | 109,280,861 | 72,985,055 | 69,836,889 (Ireland is included in the above.) |
| Deduct loan and lottery for Ireland | 744,140 | 5,953,985 | | | |
| And charges of the collection of revenue | 3,504,938 | 3,573,261 | | | |
| Total applicable to the service of Great Brit. | 116,703,579 | 107,316,643 | | | |

No deduction, the above being the net sums collected.

## PUBLIC EXPENDITURE OF GREAT BRITAIN IN EACH YEAR, FROM 1803 TO 1817, BOTH INCLUSIVE.

| | 1803. | 1804. | 1805. | 1806. | 1807. |
|---|---|---|---|---|---|
| Interest on debt, funded and unfunded | £17,861,341 | 18,698,307 | 20,022,068 | 20,524,718 | 21,021,772 |
| Management of ditto . . . | 235,891 | 253,375 | 256,483 | 275,108 | 278,594 |
| Sinking fund . . . . | 6,287,941 | 6,521,394 | 7,181,482 | 7,829,589 | 8,908,673 |
| Civil list . . . . . . | 898,000 | 1,519,842 | 958,000 | 958,000 | 958,000 |
| Various pensions and allowances . | 408,889 | 336,007 | 381,263 | 479,976 | 392,324 |
| Civil government of Scotland . | 79,502 | 79,705 | 86,918 | 83,750 | 85,359 |
| Bounties . . . . . . | 308,335 | 359,980 | 401,61[illegible] | 345,119 | 536,948 |
| Courts of justice, militia, &c. . | 172,301 | 570,479 | 512,[illegible] | 393,752 | 413,711 |
| Navy, ordnance, and army . . | 21,106,334 | 31,054,186 | 36,219,[illegible] | 35,706,582 | 36,175,060 |
| Subsidies . . . . . | — | — | — | — | 180,000 |
| East India Company . . . | 1,000,000 | — | 1,00[illegible],000 | 1,000,000 | — |
| Miscellaneous services . . | 1,800,500 | 1,161,156 | 2,1[illegible]5,334 | 1,706,676 | 1,195,448 |
| Total . | 50,159,034 | 160,554,43 | 6[illegible],084,873 | 69,303,270 | 70,145,889 |

| | 1808. | 1809. | 1810. | 1811. | 1812. |
|---|---|---|---|---|---|
| Interest on debt, funded and unfunded | £20,986,595 | 21,356,24[illegible] | 21,785,732 | 21,806,900 | 23,051,918 |
| Management of ditto . . . | 195,972 | 204,64[illegible] | 203,044 | 211,177 | 214,481 |
| Sinking fund . . . . | 9,523,339 | 10,155,1[illegible] | 10,783,018 | 11,511,486 | 12,433,345 |
| Civil list . . . . . . | 958,000 | 958,[illegible]0 | 958,000 | 958,000 | 1,019,538 |
| Various pensions and allowances . | 398,921 | 391,[illegible]3 | 395,114 | 394,321 | 532,693 |
| Civil government of Scotland . | 85,470 | 90,[illegible]4 | 118,186 | 109,693 | 112,748 |
| Bounties . . . . . . | 473,458 | 604,061 | 583,281 | 399,822 | 392,915 |
| Courts of justice, militia, &c. . | 554,689 | 460,349 | 406,526 | 430,997 | 432,115 |
| Navy, ordnance, and army . . | 39,777,854 | 42,073,316 | 43,247,044 | 47,967,547 | 49,740,111 |
| Subsidies . . . . . | 1,400,000 | 2,050,000 | 2,060,192 | 2,977,747 | 5,315,528 |
| East India Company . . . | 1,500,000 | — | 1,000,000 | 500,000 | 2,500,000 |
| Miscellaneous services . . | 1,461,359 | 1,441,722 | 1,236,151 | 1,348,446 | 2,993,243 |
| Total . . | 77,315,657 | 79,785,493 | 82,776,588 | 88,616,136 | 98,738,635 |

| | 1813. | 1814. | 1815. | 1816. | 1817. |
|---|---|---|---|---|---|
| Interest on debt, funded and unfunded | £24,224,349 | 26,409,083 | 28,357,733 | 27,614,939 | 31,583,058 |
| Management of ditto . . . | 220,153 | 221,589 | 284,673 | 278,189 | 275,735 |
| Sinking fund . . . . | 14,145,242 | 12,710,706 | 12,798,226 | 13,422,749 | 14,596,685 |
| Civil list . . . . . . | 1,028,000 | 1,246,857 | 1,028,000 | 1,028,000 | 1,191,169 |
| Various pensions and allowances . | 428,067 | 463,299 | 436,989 | 611,413 | 1,032,952 |
| Civil government of Scotland . | 113,176 | 114,032 | 126,614 | 128,515 | 130,646 |
| Bounties . . . . . . | 228,741 | 244,308 | 247,903 | 247,133 | 330,046 |
| Courts of justice, militia, &c. . | 594,812 | 545,510 | 206,633 | 196,779 | 201,900 |
| Navy, ordnance, and army . . | 54,870,672 | 60,237,851 | 43,282,432 | 25,225,620 | 17,523,328 |
| Subsidies . . . . . | 11,294,416 | 10,024,623 | 11,035,248 | 1,731,140 | 7,502 |
| East India Company . . . | 2,000,000 | — | — | — | — |
| Miscellaneous services . . | 1,717,132 | 1,856,236 | 3,187,477 | 3,776,163 | 2,369,800 |
| Total . . | 110,864,760 | 114,074,094 | 100,991,928 | 74,260,640 | 69,242,821 |

These statements form a history of our finances since 1803. The deficiency of revenue in 1817 was met by a large issue of exchequer bills. In 1818 the revenue improved by nearly £2,000,000; but there still remained a deficiency of £13,000,000, which necessitated a recourse in that year to temporary expedients; and, in the year 1819, there were a loan and a vote of additional taxes, to supply this.

We may now compare with the foregoing the following table, extracted from the Financial Accounts, printed and laid on the table of the house of commons, for the year 1832.

Net Public Income and Expenditure of the United Kingdom of Great Britain and Ireland, in the year ending 5th January, 1832.

| Income or Revenue. | Total. | Expenditure. | Total. |
|---|---|---|---|
| ORDINARY REVENUES AND RECEIPTS. | £. | FUNDED DEBT. | £. |
| Customs | 16,516,271 | | |
| Excise | 16,303,025 | Interest and Management of Permanent Debt | 24,372,894 |
| Stamps | 6,947,829 | Terminable Annuities | 3,318,688 |
| Taxes | 4,864,343 | Total Charge of the Funded Debt | 27,691,582 |
| Post Office | 1,530,205 | | |
| One Shilling and Sixpence and Four Shillings on Pensions and Salaries | 38,888 | UNFUNDED DEBT. | |
| Hackney Coaches, and Hawkers and Pedlars | 46,565 | Interest on Exchequer Bills | 649,833 |
| Small Branches of the King's Hereditary Revenue | 4,051 | | 28,341,416 |
| Surplus Fees of regulated Public Offices | 37,926 | Civil List Charges | 511,314 |
| | | Pensions | 437,568 |
| Poundage Fees, Pells Fees, &c. | 4,539 | Salaries and Allowances | 86,334 |
| | | Courts of Justice | 276,924 |
| | 46,[illegible]93,646 | Miscellaneous Charges on the Consolidated Fund | 217,324 |
| OTHER RECEIPTS. | | Mint Establishment | 16,349 |
| Imprests and other Monies | 29,367 | | |
| Monies received from the East India Company | 60,000 | Bounties for encouraging the growth of Hemp and Flax in Scotland | 2,956 |
| | | | 29,890,18[illegible] |
| Money received from the Bank of England on account of Unclaimed Dividends | 41,426 | Army | 7,216,293 |
| | | Navy | 5,689,858 |
| | | Ordnance | 1,472,944 |
| | 46,424,440 | | |
| Excess of Expenditure over Income | 698,857 | Miscellaneous, chargeable upon the Annual Grants of Parliament | 2,854,013 |
| | 47,123,298 | | 47,123,298 |

Abstract of the Net Produce of the Revenue of Great Britain, in the Years ended on the 10th October, 1831, and the 10th October, 1832.

| | Years ended October 10, 1831. | 1832. | Increase. | Decrease. |
|---|---|---|---|---|
| | £. | £. | £. | £. |
| Customs | 15,577,687 | 15,201,299 | | 376,388 |
| Excise | 14,896,521 | 14,956,307 | 59,786 | |
| Stamps | 6,484,580 | 6,528,843 | 44,263 | |
| Post Office | 1,393,011 | 1,313,000 | | 80,011 |
| Taxes | 4,945,110 | 5,022,324 | 77,214 | |
| Miscellaneous | 439,479 | 387,039 | | 52,440 |
| | 43,736,388 | 43,408,812 | 181,263 | 508,839 |
| Deduct Increase | | | | 181,263 |
| Decrease on the Year | | | | 327,576 |

An Account of the state of the Public Funded Debt of the United Kingdom on the 5th of January, 1832.

| | | |
|---|---|---|
| **Great Britain.** | | |
| Debt due to the South Sea Company at 3 per cent. | £. 3,662,78[illegible] | £. |
| Old South Sea Annuities | 3,497,8[illegible] | |
| New South Sea Annuities | 2,460,8[illegible] | |
| South Sea Annuities, 1751 | 523,[illegible]00 | |
| Debt due to the Bank of England | 14,686,[illegible]800 | |
| Bank Annuities created in 1726 | 87[illegible],050 | |
| Consolidated Annuities | 348,0[illegible]7,532 | |
| Reduced Annuities | 123,[illegible]04,712 | |
| Total, at 3 per cent. | | 497,329,679 |
| Annuities at 3½ per cent., anno 1818 | [illegible]553,755 | |
| Reduced Annuities, do. | [illegible],386,707 | |
| New 3½ per cent. Annuities | [illegible]8,078,982 | |
| Total, at 3½ per cent. | | 214,019,445 |
| 4 per cent. Annuities, created 1826 | | 10,804,595 |
| New 5 per cent. Annuities | | 462,736 |
| Great Britain | | 722,616,456 |
| **Ireland.** | | |
| Irish Consolidated Annuities, at 3 per cent. | 2,673,545 | |
| Irish Reduced Annuities, do. | 145,078 | |
| Total, at 3 per cent. | | 2,818,624 |
| 3½ per cent. Debentures and Stock | 14,520,904 | |
| Reduced 3½ per cent. Annuities | 1,277,768 | |
| New 3½ per cent. Annuities | 11,672,700 | |
| Total, at 3½ per cent. | | 27,471,373 |
| Debt due to the Bank of Ireland, at 4 per cent. | | 1,615,384 |
| New 5 per cent. Annuities | 6,661 | |
| Debt due to the Bank of Ireland, at 5 per cent. | 1,015,384 | 1,022,045 |
| Ireland | | 32,927,428 |
| Total, United Kingdom | | £755,543,884 |

## UNFUNDED DEBT.

The total amount of Exchequer Bills outstanding on the 5th of January, 1832, £27,123,350

'The effect of the *national debt* on the general internal circumstances of the country, and on the intercourse between man and man involved in all the transactions of business,' argues a late writer in the Quarterly Review, 'is not, perhaps, as correctly understood as might have been expected, in a country where a national debt has so long existed. If an individual has a rental of £5000 per annum; and pays, in direct or indirect taxes, £1000 per annum, which he would not pay but for the existence of the national debt, he is, in point of fact, not the possessor of £5000 per annum, but of £4000. If a servant receives twenty pounds wages, and pays, in direct or indirect taxation, twenty per cent., in point of fact his real wages are only sixteen pounds instead of twenty. If this illustration were pursued, it would be found that every person, the payer of direct or indirect taxes, must be so much the poorer in consequence of this national debt; but nevertheless that—admitting, for the sake of argument, that the debt could be so adjusted, that every man should only pay a certain amount, which should be exactly twenty per cent.,—all parties would remain in the same relative positions towards each other, as if no debt existed. Now, let the case be supposed—that, in a country where no taxes exist, a proprietor of land has a rental of £5000 a-year, and a mortgage of £20,000 at five per cent. upon his property—he would be precisely in the same situation as an English landlord, whose real income would be £4000 and not £5000 per annum. The effect, therefore, of the national debt, if it could be duly adjusted, would be to make every member of the community nominally poorer, as to real income, but yet to keep all of them equally rich with respect to each other; and this most important condition must be remembered, that the debt would exclusively fall on those parties who paid taxes, directly or indirectly. If population were not redundant,—if the demand for the services of the laboring classes were proportioned to the supply of labor—those classes would suffer the least from the operation of the national debt, because they would secure themselves by an adequate rate of wages from any burden of the debt, which could fall on them beyond their fair share, as direct or indirect payers of taxes. But when population is redundant, they have no compensating remedy of this sort.

'The main inconvenience arising from the national debt consists in the utter impossibility, with any ingenuity of legislation, of adjusting the different proportions of that debt, which particular classes should in equity contribute, so permanently, as not to admit of occasional dislocations of such contributions; for, of course, when from such dislocation, in itself unavoidable, any one class is called upon to pay more, in point of fact, of the general debt than its own fair share, the distress and injury of all who belong to it must be the result. It is perfectly well known that every human being sustains a weight of air of great magnitude, but that, from the equality of the pressure on every part of his body, he moves about as if the pressure did not exist. The moment, however, that that uniform and balanced pressure is removed from any one part, then it is that the weight of the atmosphere is felt, and, as every person conversant with the elements of natural philosophy knows, would, if suffered long, injure, if not destroy the human frame. This analogy would be applicable at all points to the national debt, if that debt were not in its essence an evil; for if the debt could be adjusted to every person with that mathematical accuracy with which nature has adjusted the pressure of the air, it is not a paradox to say that much of the inconvenience of the debt would cease to be felt. But the main and the essential evil lies behind; it is this: that under a system of national debt, a thousand circumstances require to be directed by legislation, which would find their own level without legislation, but for the existence of this universal mortgage; and nothing is more to be regretted than that the speculative remedies suggested by ingenious men for the annihilation of the debt, by a concurrent sacrifice on the part of all classes of the community, involve measures infinitely more complicated, even than those which are necessary for adjusting the practical inconveniences inseparable from its existence.'

This writer afterwards insists—'For the current expenditure the existing government is responsible—for the establishments, for their necessity, for their efficiency; but for the payment of the interest of the national debt, it has no individual character of responsibility. To provide for that payment is the business of the nation at large. Its amount is not regulated by discretion, which is the case in establishments. It remains, for the most part, one and the same immutable, a fixed quantity, and must remain so until, on the one hand, it be discharged, or, on the other hand, it be diminished;—two alternatives, the one of which, is all but impossible, and the other, it is to be feared, more than improbable, with the exception of the effect of a small real sinking-fund. This mode of presenting for observation the Financial Accounts of the year saddles the government exclusively with an odium to which (as already contended) it has no exclusive claim. The proportionate extent and influence of the national debt, as compared with the current expenditure of government, will be appreciated by any person who will take the trouble of inspecting our scale. If it be necessary that the ministers of the day should be considered as stewards of this great national mortgage—as a kind of committee appointed to communicate on the subject of it to parliament and to the country—why should they not appoint an exclusive day for its consideration, and thereby rid themselves of that unreal responsibility which the present system of confused and blended accounts gratuitously throws upon them? We beg not to be understood as taking any extravagantly dark and gloomy view of the national debt, which we would thus desire to see separated from the current expenditure of the government establishments; on the contrary, we would ask if it be not, after all, a plain truth, that this country, at the present moment (depressed as it may be), is ten times more able to support and maintain its present debt, and its present establishments, than it would have been

able to maintain one-fourth part of that debt and of those establishments in the reign of queen Anne? May not a period arrive, at which this country may be able to sustain a debt twice as great, without one-twentieth part of the inconvenience now endured, collectively and individually? Undoubtedly, no man of fair information and common candor will deny that these questions may be reasonably answered in the affirmative. He may, indeed, doubt as to the existence of any future period when such speculations may be realised. With respect to public debt, the country have learnt a lesson which will not be easily forgotten; they have learnt that, to carry on a war-expenditure much greater than the current supplies of the year, must inevitably entail upon posterity a charge and inconvenience, which ought to make the country more than unwilling to consent to the recurrence of such anticipation of future resources. Occasions may arise in which no sacrifice ought to be considered as too great. Such have arisen heretofore; and mighty sacrifices have purchased good too great to be estimated in pounds, shillings, and pence.

Sic species terris, vitæ sua forma, suusque
Dis honor,—IPSA sibi tandem sic reddita MENS est.'

If national honor and the good of man again require such a sacrifice, undoubtedly it ought again to be made; but if ever it be so made, it will be made with a more accurate appreciation of the consequences than was felt by those whose measures incurred the existing debt, or by the people, who were strictly, and all but unanimously, consentient to the enactment of those measures.

'If a private individual, a country gentleman, for example, has a rental of £6000 per annum, and a rent-charge upon it of £4000 per annum, his expenditure, if he be a prudent man, is necessarily limited to his real surplus, namely £2000; and if he has the reputation of having a rental of £6000, and an acknowledged expenditure of only £2000, supposing that he has no special motives for economy, he sustains the imputation of niggardliness, from the apparent disproportion between his income and expenditure. Precisely the converse effect takes place with respect to the government: the government having an income of £60,000,000 per annum, more than £40,000,000 of which, if duly analysed, will be found to belong to the annual charge of the existing debt, has the reputation of being criminally lavish with respect to its establishments, the expenses of which are blended together, most gratuitously and unfortunately, with the interest of the debt. If the accounts were kept strictly separate, the extent of the expenditure for which the government were really responsible would be found to be less than one-third of the whole; whereas now, the line of distinction between the two is not in the slightest degree preserved.' But we shall return to the subject under the article FUNDS.

The *poor laws* of England are amongst the most serious burdens of the people. In three years, ending 1750, they averaged only £692,000 in England and Wales: in three years, ending 1815, £6,[illegible]47,000. But wheat, it is to be observed, was only 4*s.* 5*d.* per bushel in the former case, and 12*s.* 8*d.* in the latter. It is stated that the number of persons receiving relief is greater by far in this country than it ever has been in any other at any period, being, on a rough calculation, one in every *eleven* of the population.

A report of the committee of the house of commons on the Poor Laws in 1817 exhibits the following detailed returns on this subject both for London and the country.

I.—RETURN of POOR-RATES from London, Westminster, and Southwark, being from the Parishes within the Bills of Mortality, delivered to Parliament 21st of February, 1817.

| | Year Ending | | |
|---|---|---|---|
| | Easter 1813. | Easter 1814. | 25th March 1815. |
| | £ | £ | £ |
| Total raised in the metropolis by poor's rate, and smaller rates, such as church-rate, highway-rate, &c. | 446,542 | 501,952 | 489,321 |
| Charitable donations for parish schools and other purposes | 18,983 | 19,620 | 20,160 |
| *Expenditure.* | | | |
| Relief and maintenance of the poor | 370,518 | 401,954 | 380,281 |
| Lawsuits, removals, expenses of overseers, and other officers | 15,324 | 17,416 | 17,433 |
| Families of militia-men | 12,916 | 10,837 | 6,613 |
| Church-rate, highway-rate, county-rate, &c. | 98,903 | 113,574 | 103,807 |
| Total | 497,661 | 543,781 | 508,134 |
| *Number of Poor relieved permanently.* | | | |
| In workhouses | 13,389 | 13,373 | 12,341 |
| Out of workhouses (without reckoning the children) | 12,654 | 13,762 | 13,341 |
| Parishioners relieved occasionally, either in or out of workhouses | 40,993 | 69,332 | 70,322 |
| | 67,036 | 96,467 | 96,004 |

## II.—*Returns applicable to the Kingdom at large.*

| | Year Ending Easter 1813 | Easter 1814. | 25th March 1815. |
|---|---|---|---|
| | £. | £. | £. |
| Total money raised by Poor-rate; and in a smaller degree, by church-rate, highway-rate, county-rate, &c., in England and Wales . . . . . . . . | 8,651,438 | 8,392,728 | 7,460,855 |
| To these sums are to be added charitable donations, whether arising from land or money, managed by the clergy, churchwardens, or overseers; annual average . . . . | 238,310 | 238,310 | 238,310 |
| Expenditure. | | | |
| For the maintenance and relief of the poor . . . . | 6,679,658 | 6,297,331 | 5,421,168 |
| Lawsuits, removal of paupers, and expenses of overseers, or other officers . . . . . . . . . . | 325,107 | 332,966 | 324,665 |
| Families of militia-men and other militia charges . . | 246,202 | 188,576 | 105,394 |
| Church-rate, county-rate, highway-rate, &c. . . . | 1,614,871 | 1,692,990 | 1,657,627 |
| | 8,865,838 | 8,511,863 | 7,508,854 |
| *Number of Persons relieved by this Expenditure.* | | | |
| Poor permanently relieved in workhouses . . . | 97,223 | 94,085 | 88,115 |
| Poor permanently relieved out of workhouses (without reckoning children) . . . | 434,441 | 430,140 | 406,887 |
| Parishioners relieved occasionally | 440,249 | 429,770 | 400,971 |
| Total of paupers relieved | 971,913 | 953,995 | |

| | |
|---|---|
| The property liable to poor-rate consists of the land and houses of England, the annual rent of which, under the latest estimate, is . . . . . . . | £51,898,424 |
| Deducting for various allowances and abatements, the fractional sum . . . | 1,898,424 |
| Remains . | £50,000,000 |
| The total sum expended on the relief of the poor in 1821-2, ending Easter of the latter year was . . . . . . . . . . . . . . . . | £6,358,703 |
| The total poor-rate expended in 1831 amounted to . . . . . . . . | £6,798,888 |

The history of our poor laws is a very interesting and important study. Our law takes notice of the poor, 1st. By impotency and defect; as the aged or decrepid, fatherless, or motherless; poor under sickness, and persons who are idiots, lunatics, lame, blind, &c.; these the overseers of the poor are to provide for. 2dly. Poor by casualty; such as housekeepers, decayed or ruined by unavoidable misfortunes; poor persons overcharged with children; laborers disabled, and these, having ability, are to be set to work; but if not able to work, they are to be relieved with money. 3dly. Poor by prodigality and debauchery, also called thriftless poor; as idle slothful persons, pilferers, vagabonds, strumpets, &c., who are to be sent to the house of correction, and be put to hard labor, to maintain themselves; or work is to be provided for them that they do not perish by want; and if they become impotent by sickness, or if their work will not maintain them, there must be an allowance by the overseers of the poor for their support. There is no man so indigent or wretched, but he may demand a supply sufficient to all the necessities of life, from the more opulent part of the community, by means of the several statutes enacted for relief of the poor. 1 *Black. Comm.* 131.

The poor of England, till the time of Henry VIII., subsisted entirely upon private benevolence and the charity of well-disposed Christians; and the poor in Ireland have, to this day, no relief except from private charity. By an ancient statute, 23 Edw. III., cap. 7, it was enacted, that none should give alms to a beggar able to work. It appears by the Mirror, that at the common law, the poor were to be 'sustained by parsons, rectors of the church, and the parishioners; so that none of them die for default of sustenance.' And by stats. 15 Rich. II., cap. 6; 4 Hen. IV., cap. 12, impropriators were obliged to distribute a yearly sum to the poor parishioners, and to keep hospitality. By stats. 12 Rich. II., cap. 7; 19 Hen. VII., cap. 12, the poor were directed to abide in the cities and towns wherein they were born, or such wherein they had dwelt for three years; which seems to be the first rudiment of parish settlements.

No compulsory method, however, was marked out for the relief of the poor, till the stat. 27 Hen. VIII., cap. 25; under which provision was ordered to be made for the impotent poor. Before that time, the monasteries were their principal resource; and among other bad effects, which attended these institutions, it was not,

perhaps, one of the least, though frequently esteemed quite otherwise, that they supported and fed a very numerous and very idle poor; whose sustenance depended upon what was daily distributed in alms at the gates of the religious houses. But, upon the total dissolution of these, the inconvenience of thus encouraging the poor in habits of indolence and beggary, was quickly felt throughout the kingdom; and abundance of statutes were made in the reign of king Henry VIII. and his children, for providing for the poor and impotent; which, the preambles to some of them recite, had of late years greatly increased. These poor were principally of two sorts; sick and impotent, and therefore unable to work: idle and sturdy, and therefore able, but not willing to exercise any honest employment. To provide, in some measure, for both of these, in and about the metropolis, Edward VI. founded three royal hospitals; Christ's and St. Thomas's, for relief of the impotent, through infancy or sickness; and Bridewell, for the punishment and employment of the vigorous and idle.

But these were far from being sufficient for the care of the poor throughout the kingdom at large; and, therefore, after many other fruitless experiments, by stat. 43 Eliz. cap. 2, overseers of the poor were appointed in every parish, whose office and duty are principally these: first, to raise competent sums for the necessary relief of the poor, impotent, old, blind, and such other being poor, and not able to work, and them only; and, secondly, to provide work for such as are able and cannot otherwise get employment; but this latter part of their duty, which, according to the wise regulations of that salutary statute, should go hand in hand with the other, is now most shamefully neglected. 1 *Black. Comm.* cap. 9, pp. 359. 460.

Mr. Justice Blackstone states, at considerable length, the evils arising from what he considers as a deviation from the original purpose of the poor laws, by accumulating all the poor in one workhouse; a practice which he condemns as destructive of the industry and domestic happiness of the poor. He also reprobates the subdivision of parishes; the plan of confining the poor to their respective districts; and the laws passed since the Restoration; as having given birth to the intricacy of our poor laws, by multiplying and rendering more easy the methods of gaining settlements; and, in consequence, creating an infinity of expensive law-suits between contending neighbourhoods, concerning those settlements and removals. He now proceeds to state the general heads of the law relative to the settlement of the poor; which, he truly observes, by the resolutions of the courts of justice thereon, within a century past, are branched into a great variety. 'And yet,' he concludes, 'notwithstanding the pains that have been taken about these laws, they still remain very imperfect, and inadequate to the purposes they are designed for; a fate that has generally attended most of our statute laws, where they have not the foundation of the common law to build upon. When the shires, the hundreds, and the tithings were kept in the same admirable order in which they were disposed by the great Alfred, there were no persons idle, consequently, none but the impotent that needed relief; and the stat. 43 Eliz. cap. 2, seems entirely founded on the same principle. But when this excellent scheme was neglected and departed from, we cannot but observe, with concern, what miserable shifts and lame expedients have from time to time been adopted, in order to patch up the flaws occasioned by this neglect. There is not a more necessary or certain maxim, in the frame and constitution of society, than that every individual must contribute his share, in order to the well-being of the community; and, surely, they must be very deficient in sound policy, who suffer one-half of a parish to continue idle, dissolute, and unemployed; and at length are amazed to find that the industry of the other half is not able to maintain the whole.' 1 *Black. Comm.* cap. 9.

The average sum applied to the relief of the poor for the years 1748, 1749, 1750, was £690,000 per annum. In 1776 it amounted to £1,531,000, an increase far beyond what the rise in the prices of corn would justify; in 1783, 1784, 1785, to £2,000,000, though the average price of corn had fallen during the nine intermediate years.

In the year 1795 a change took place in the administration of the poor laws, which has completely altered the state of the country. This was a winter of unusual scarcity. The price of corn, per quarter, which for the three preceding years had stood at £2 14*s.*, averaged more than £4 during the whole of 1795 and 1796. As the returns of labor could not be expected to keep pace with such a sudden rise in the necessaries of life, distress was universal; and there appeared as claimants for parochial relief, not only the infirm and aged, but the able-bodied and industrious, who had few of them ever before resorted to the parish, and that only during temporary illness and disability. It was at this season of acknowledged difficulty, that the county magistrates, first in Berkshire, and afterwards in other parrs of the middle and south of England, agreed to relieve the poor according to a fixed and uniform scale, regulated by the price of bread; and issued a table, which professed to show, at one view, what should be the weekly income of the laboring poor, which it fixed in a certain ratio, according to the price of bread and the size of the family. Whatever the man's labor produced less than the provisions of this table required, was made up by the parish, whose compliance was subsequently enforced by the legislature; and the justices were empowered, under certain conditions, to order relief out of the workhouse, and to those who possessed property of their own. 36 Geo. III. cap. 23.

The practical operation of this system has been thus illustrated. Every laborer is presumed to require a gallon loaf of standard wheaten bread, weekly, for every member of his family, and one over; i. e. four loaves for three persons; seven for six. A B has a wife and four children; he claims seven gallon loaves, costing, we will suppose, 12*s.* But his wages are only 9*s.*; therefore the parish supplies him

with 3s. weekly. C D has a wife and six children; he requires nine gallon loaves, or 14s. 8d. He earns 10s.; the parish makes up the rest. E F is so idle and disorderly, that no one will employ him; but he has a wife and five children, and requires eight gallon loaves for their support. His allowance, then, is 9s. in lieu of the wages which he ought to earn, and 5s. or 6s. to make up the deficiency of these wages.

The distress which followed the spring of 1815, the consequent increase of the poor-rates, and the difficulty of meeting them, brought our existing system into full operation, and led to a long and diligent enquiry into the whole subject before a committee of the house of commons, in the session of 1817. From the returns which were then made from the manufacturing towns of Birmingham, Manchester, Coventry, &c.; and also from many districts solely agricultural, it clearly appeared that the excess of demand above the funds prepared to answer it, was not merely a theoretical evil, but one which some districts had already experienced, and to which all were more or less rapidly approaching. In Manchester, according to the report of the committee, the relief given to the out-door poor increased, within ten years from 1805, to £14,000, instead of £8000 per annum; and the whole expenditure, from £16,000 to £27,000, in the most moderate years; in dear seasons, one-third more. In Birmingham the increase in ten years was one-third, being £20,000 in 1806, £30,000 in 1816. Distraint for rates became very general; and every distraint was felt to be a wasteful encroachment upon the national resources.

'Whether the assessment,' said the committee, 'be confined to land and houses, as at present, or other denominations of property be made practically liable to the same charge, the committee feel it their imperious duty to state their opinion, that, unless some efficacious check be interposed, there is every reason to think that the amount of the assessment will continue, as it has done, to increase, till at a period, more or less remote, according to the progress the evil has already made in different places, it shall have absorbed the profits of the property on which the rates may have been assessed; producing thereby the neglect and ruin of the land, and the waste or removal of other property, to the utter subversion of that happy order of society so long upheld in these kingdoms.

'The gradual increase which has taken place both in the number of paupers, and in the assessment for their support, can hardly fail to have arisen from causes inherent in the system itself; as it does not appear to have depended entirely upon any temporary or local circumstances. Scarcity of provisions, and a diminished demand for particular manufactures, have occasioned, from time to time, an increased pressure in particular parishes.' But, by comparing the assessments in the two counties in this kingdom, in which the largest portion of the population is employed in agriculture, namely, Bedfordshire and Herefordshire, it will be seen that there has been the same progressive augmentation in the amount of the assessments, as may be observed to have taken place in the manufacturing counties.'

| | Money Expended on Paupers, in the year ending Easter 1776, omitting fractions. | Average Expenditure on Paupers, 1783-4-5. | Expenditure 1803. | Expenditure 1815. |
|---|---|---|---|---|
| County of Hereford | £10,593 | 16,727 | 48,067 | 59,255 |
| Bedford | 16,662 | 20,977 | 38,070 | 50,370 |

By this table, it appears, that the charge on the rates, in 1815, not in two or three counties only, but taking England throughout, was double its amount in 1795; though, in 1815, the price of corn had sunk to a moderate average. A comparison of these rates in the five following years, i. e. to 1820, as digested in the poor-rate returns, ordered to be printed in July 1821, shows the same alarming tendency to increase.

| Years. | Expended for the Relief of the Poor. | Average Price of Corn per Qr. | |
|---|---|---|---|
| | £. | s. | d. |
| 1815 | 5,418,845 | 70 | 6 |
| 1816 | 5,724,506 | 61 | 10 |
| 1817 | 6,918,217 | 87 | 4 |
| 1818 | 7,890,148 | 90 | 7 |
| 1819 | 7,531,650 | 82 | 9 |
| 1820 | 7,329,594 | 69 | 5 |

By this table, it will appear, that as the price of corn in 1815 and 1820 was the same, the amount of the rates ought likewise to have been the same, with the addition of 10 per cent. for increase of population. It ought, therefore, to have been 6,000,000 in 1820, according to the scale of 1815. But it is 7,000,000, giving 1,000,000, or one-sixth of the whole, as the actual growth of five years. We shall have an opportunity of pursuing this important subject further hereafter; documents sufficient have been now laid before the reader to show its legal and statistical basis. We have only room to observe, that a plan of fixing the maximum of these rates was laid before parliament in 1821; but clogged with so many objectionable alterations in the law of settlement, that it met with little attention. Mr. Malthus makes the following important objections to the very nature of this plan: 'Under such a law, if the distresses of the poor were to be aggravated tenfold, either by the increase of numbers, or the recurrence of a scarcity, the same sum would invariably be appropriated to their relief. If, in the meantime, the statute which gives the poor a right to support, were to remain unexpunged, we shall add to the cruelty of starving them, the injustice of still professing to relieve them. If this statute were expunged or altered, we should virtually deny the right of the poor to support, and only retain the absurdity of saying that they had a right to a certain sum.' *On Population*, III., p. 353.

This objection, says an able writer in the Supplement to the Encyclopædia Britannica, equally applies to an amendment which has been since proposed, to render the maximum a gradually decreasing maximum, by subtracting from its amount 10s. or 12s. per cent. annually, till the whole was extinct. To any one acquainted with the manner in which the affairs of a parish are and must be conducted, taking the country at large, such impossibilities must occur in the execution of a law of this nature, as render it quite undeserving attention as a national measure. The business of overseer, for the first half of the year, would go on smoothly enough. By that time, three-fourths of the legal assessment would probably be spent. Then all, whatever might be their wants, must be put on short allowance, and future claimants excluded. But each of such claimants would justly consider that he had as good a right to be supported in the hour of need, as those who happened to be visited with misfortune a few months before; and those whose mischance it was to be in distress when the fixed sum was collected and expended, would be particularly ill used on being refused assistance, while so many others around them had enjoyed this advantage. If such a measure were passed, it would be virtually repealed in half the parishes of the kingdom before the expiration of five years. Besides, there is nothing in any measure of this kind, which tends to stem the progress of pauperism; nothing to prevent the numbers from annually increasing, which require public assistance. All the channels by which the main stream is supplied, as described in the beginning of this article, remain the same; why, then, should we expect that the stream itself should grow narrower, or cease to overflow its bounds? If, then, the sum collected were to be divided among all who might be in want, however their number might increase, great misery must ensue; and all the blame of it would be laid, not without much apparent justice, to the charge of the society, which undertook the support of the poor, yet supplied them so sparingly, that they must necessarily die of hunger and disease. 'The only measure which can be considered as either politically wise, or practically efficient, is one which shall gradually annihilate the system by attacking directly its vital principle, and striking at the root of the disease.'

Mr. Malthus, therefore, proposes that a regulation should be made, declaring, that no child, born from any marriage taking place after the expiration of a year from the date of the law, and no illegitimate child, born two years from the same date, shall ever be entitled to parish assistance. And, to give a more general knowledge of this law, and to enforce it more strongly on the minds of the lower classes of people, the clergyman of each parish should, after the publication of bans, read a short address, stating the strong obligation on every man to support his own children; the impropriety, and even immorality, of marrying without a prospect of being able to do this; the evils which had resulted to the poor themselves, from the attempt which had been made to assist, by public institutions, in a duty which ought to be exclusively appropriated to parents, and the absolute necessity which had, at length, appeared of abandoning all such institutions, on account of their producing effects totally opposite to those which were intended. 'This would operate as a fair, distinct, and precise notice, which no man could well mistake; and, without pressing hard upon any particular individuals, would at once throw off the rising generation from that miserable and helpless dependence upon the government and the rich, the moral as well as physical consequences of which are almost incalculable.'

We add on this subject the following more recent STATEMENT, showing the amount of the PAROCHIAL ASSESSMENTS, in each county of ENGLAND and WALES in the year ending March 25th, 1823, distinguishing in column

No. 1. The proportion levied on lands.
2. The proportion levied on dwelling-houses.
3. The proportion levied on mills and factories.
4. The proportion levied on manorial profits, &c.
5. Total.
6. The number of inhabited houses in each county.

The number of inhabited houses in each county assessed at £50, but under £110 per annum.

The number of inhabited houses in each county assessed at £110, but under £160 per annum.

The number of inhabited houses in each county assessed at £160 and all above.

## STATEMENT.

| Counties in order of Total Population. | No. 1. | No. 2. | No. 3. | No. 4. | No. 5. | No. 6. | No. 7. | No. 8 | No. 9 |
|---|---|---|---|---|---|---|---|---|---|
| | £ | £ | £ | £ | £ | | | | |
| LONDON. | | | | | | 17,170 | 4,111 | 822 | 571 |
| 1 Middlesex . 38 | 38,116 | 512,903 | 38,769 | 503 | 590,291 | 117,197 | 11,965 | 1568 | 1173 |
| WESTMINSTER. | | | | | | 18,502 | 5117 | 981 | 597 |
| 2 Lancaster . 12 | 157,791 | 107,738 | 49,375 | 11,574 | 326,478 | 176,449 | 2125 | 132 | 41 |
| 3 York, W. Rid. 5 | 185,658 | 65,887 | 61,826 | 8,597 | 281,969 | 154,314 | 752 | 20 | 9 |
| 4 Devon . . . 1 | 175,412 | 47,461 | 2,624 | 1,927 | 227,425 | 71,416 | 414 | 4 | 1 |
| 5 Kent . . . 7 | 257,917 | 106,452 | 8,258 | 1,159 | 373,787 | 70,50[illegible] | 814 | 50 | 35 |
| 6 Surrey . . . 25 | 83,585 | 148,026 | 19,672 | 1,355 | 252,639 | 64,790 | 3,105 | 338 | 175 |
| 7 Somerset . . 6 | 136,841 | 32,398 | 1,993 | 3,350 | 174,582 | 61,852 | 2,201 | 390 | 102 |
| 8 Norfolk . . 2 | 224,977 | 50,248 | 4,205 | 2,728 | 282,158 | 62,274 | 80 | 2 | — |
| 9 Stafford . . 17 | 99,715 | 27,145 | 6,024 | 7,376 | 140,257 | 63,319 | 107 | 8 | 3 |
| 10 Gloucester . 11 | 95,286 | 51,786 | 5,538 | 1,288 | 153,897 | 60,881 | 819 | 119 | 32 |
| 11 Essex . . . 4 | 225,493 | 44,080 | 6,205 | 1,235 | 277,013 | 49,978 | 358 | 41 | 11 |
| 12 Southampton . 10 | 145,278 | 42,926 | 2,529 | 293 | 191,026 | 49,516 | 479 | 19 | 10 |
| 13 Lincoln . . 3 | 166,761 | 21,874 | 4,067 | 418 | 193,118 | 53,818 | 83 | 1 | — |
| 14 Warwick . . 19 | 89,726 | [illegible]7,923 | 9,618 | 2,399 | 139,667 | 55,012 | 224 | 8 | 12 |
| 15 Suffolk . . . 8 | 214,667 | [illegible],965 | 5,286 | 829 | 259,748 | 42,773 | 58 | — | — |
| 16 Chester . . 18 | 89,797 | [illegible]660 | 5,219 | 1,537 | 117,213 | 47,094 | 154 | 5 | 2 |
| 17 Cornwall . . 14 | 87,235 | 1[illegible]87 | 2,196 | 6,318 | 112,537 | 43,873 | 38 | 1 | — |
| 18 Sussex . . . 13 | 217,246 | 37[illegible]49 | 4,269 | 692 | 259,256 | 36,283 | 646 | 25 | 14 |
| 19 Wilts . . . 9 | 132,358 | 22,[illegible]3 | 2,682 | 1,390 | 158,753 | 41,702 | 95 | 2 | 2 |
| 20 Derby . . . 29 | 75,068 | 12,[illegible]0 | 1,727 | 1,320 | 90,336 | 40,054 | 78 | 4 | 6 |
| 21 Durham . . 37 | 67,914 | 20,114 | 6,332 | 12,536 | 106,900 | 32,973 | 51 | — | — |
| 22 Salop . . . 16 | 75,619 | 13,497 | 1,167 | 2,590 | 92,873 | 38,863 | 79 | 2 | — |
| 23 Northumberl. . 34 | 54,022 | 17,998 | 8,128 | 4,038 | 84,187 | 31,526 | 272 | 7 | 4 |
| 24 York, E. Rid. 24 | 70,537 | 33,260 | 2,602 | 610 | 107,009 | 34,930 | | | |
| 25 Nottingham . 30 | 57,613 | 20,215 | 2,863 | 630 | 81,321 | 35,022 | 127 | 1 | — |
| 26 Worcester . . 26 | 65,031 | 13,379 | 3,384 | 1,820 | 83,615 | 34,734 | 190 | 7 | 2 |
| 27 York, N. Rid. 20 | 76,105 | 8,623 | 1,177 | 360 | 86,266 | 35,765 | | | |
| 28 Leicester . . 33 | 91,200 | 18,415 | 373 | 313 | 110,306 | 34,775 | 95 | 2 | 2 |
| 29 Northampton . 15 | 132,002 | 11,667 | 581 | 1,266 | 145,516 | 32,503 | 54 | 2 | — |
| 30 Cumberland . 35 | 43,503 | 12,625 | 894 | 1,518 | 58,540 | 27,246 | 56 | 4 | — |
| 31 Dorset . . . 27 | 70,744 | 14,572 | 1,353 | 1,513 | 88,182 | 25,926 | 91 | 3 | 1 |
| 32 Oxford . . . 22 | 98,711 | 18,657 | 869 | 393 | 118,634 | 25,594 | 74 | 3 | 3 |
| 33 Buckingham . 21 | 102,610 | 13,738 | 1,659 | 379 | 118,387 | 24,786 | 87 | — | 3 |
| 34 Berks . . . 28 | 76,705 | 18,593 | 2,145 | 715 | 98,158 | 24,705 | 185 | 10 | 2 |
| 35 Hertford . . 32 | 73,[illegible]8 | 19,553 | 2,455 | 318 | 95,935 | 23,178 | 162 | 7 | 2 |
| 36 Cambridge . 23 | 78,285 | 13,826 | 1,464 | 592 | 94,167 | 20,869 | 92 | 3 | 1 |
| 37 Hereford . . 31 | 57,024 | 6,436 | 208 | 98 | 63,767 | 20,061 | 17 | — | — |
| 38 Bedford . . 36 | 66,264 | 6,387 | 644 | 142 | 73,437 | 15,412 | 9 | 1 | 2 |
| 39 Monmouth . 40 | 23,210 | 4,723 | 669 | 1,330 | 29,932 | 13,211 | 12 | — | — |
| 40 Westmoreland 41 | 24,529 | 3,156 | 607 | 155 | 28,447 | 9,243 | 32 | 2 | — |
| 41 Huntingdon . 39 | 35,703 | 4,832 | 438 | 137 | 41,110 | 8,878 | 24 | — | — |
| 42 Rutland . . 42 | 11,353 | 1,016 | 50 | 5 | 12,425 | 3,589 | 5 | 1 | 3 |
| ENGLAND | 4,351,227 | 1,740,139 | 242,153 | 87,748 | 6,421,267 | 1,951,973 | 35,733 | 3608 | 2626 |
| WALES | 251,025 | 22,811 | 5,237 | 3,161 | 282,234 | 136,183 | 74 | 2 | 1 |
| TOTAL | 4,602,252 | 1,762,950 | 247,390 | 90,909 | 6,703,501 | 2,097,066 | 35,708 | 3610 | 2627 |

Tne population return of 182[illegible], represents 2,088,156 houses in England and Wales as being inhabited in that year, another return made to parliament in the session of 1823, represents 437,626 out of that number charged with duty, on the assessed taxes in the year ending April 5th, 1822, the total value assessed being £10,168,574, and the amount of the assessment £1,180,250, about half of which amount is contributed by the 41,945 houses enumerated in the above statement. 202,628 farm houses occupied by tenants, and used bonâ fide for husbandry,—exempt leaving the occupiers of 1,447,902 out of the 2,088,156 houses inhabited in 1821 to be too impoverished to contribute to direct taxation.

There is another topic connected with the financial and statistical History of England, to which we may be allowed to advert, and on which we can supply some interesting details in this place, although in a preceding article we have in part anticipated it,—that of our numerous Assurance and Insurance Societies for lives, and against the casualties of fire, shipwreck, &c.

The following are the companies for the assurance for lives, and insurance against fires, losses by shipwreck, &c., enumerated in the late work of Mr. Babbage on this subject.

| Name of Office. | | | Nominal Capital. | Capital paid up. | Table of Mortality. | Proportion of Profit given Assured. | Periods of Division. |
|---|---|---|---|---|---|---|---|
| | | | £ | | | | |
| Ægis . . . . . | F & L | Prop. | 1,000,000 | | Same as Guardian | None | . . . . |
| Albion . . . . | F & L | Prop. | 1,000,000 | 100,000 | Northampton | None | . . . . |
| Alliance . . . | F & L | Mixed | 5,000,000 | 500,000 | | | . . . . |
| Amicable . . | L | Mixed | None | None | About 3s. less than North. | Seven-Eighths | Every Year |
| Atlas . . . . . | F & L | Mixed | 1,200,000 | 120,000 | Northampton | Unknown | 7 Years |
| Asylum . . . . | L | . . . . | 240,000 | 60,000 | | Unknown | 5 Years |
| British Com. | L | Prop. | 1,000,000 | 100,000 | | None | . . . . |
| Crown . . . . | | Mixed | 1,500,000 | 150,000 10 per cent. | | Two-thirds | . . . . |
| Eagle . . . . . . | F & L | Prop. | 1,000,000 | 100,000 | Northampton | None | . . . |
| Economic . . . | L | Mixed | 200,000 | 50,000 | . . . . . . . . | Three-fourths | . . . . |
| Equitable . . . | L | Mixed | None | None | Northampton | | 10 Years |
| European . . . | L | Mixed | 1,000,000 | 100,000 | | | 7 Years |
| Exchange Royal | F & L | Prop. | 745,000 | | Northampton | None | . . . . |
| Globe . . . . . . | F & L | Prop. | 1,000,000 | 1,000,000 | Northampton | None | . . . . |
| Guardian . . . . | F & L | Mixed | 2,000,000 | 200,000 | | | 7 Years |
| Hope . . . . . . | F & L | Mixed | 1,000,000 | 100,000 | Northampton | Unknown | Unknown |
| Imperial . . . . | L | Mixed | 750 000 | 75,000 | Northampton | Two-thirds | . . . . |
| Law Life . . . . | L | Mixed | 1,000,000 | 100,000 10 p. c. paid | Northampton | Four-fifths | . . . . |
| Lon. Assurance | F & L | Prop. | | | | None | . . . . |
| London Life Association | L | Mixed | None | None | Northampton | One-fifth | . . . . |
| Medico-Clerical | L | Mixed | Unknown | | | | Five or 7 Years |
| Norwich Union | F & L | Mixed | None | None | | | 7 Years |
| Palladium . . . | F & L | Mixed | 2,000,000 | 80,000 | Northampton | Four-fifths | 7 Years |
| Pelican . . . . . | L | Prop. | | | Northampton | None | . . . . |
| Provident . . . | L | Mixed | 250,000 | 25,000 | Northampton | . . . . . . . . | 7 Years |
| Rock . . . . . . | L | Mixed | 2,000,000 | 200,000 25 pd. on 50 | Northampton | Two-thirds | 7 Years |
| Sun . . . . . . . . | F & L | Prop. | | | | None | . . . . |
| University . . . | L | Mixed | 600,000 | 60,000 | | Four-fifths | 5 Years |
| Union . . . . . . | F & L | Mixed | 300,000 | 30,000 | Northampton | . . . . . . . | 7 Years |
| United Empire . | L | Prop. | | | | Two-fifths | 5 Years |
| West of Engld. | F & L | Prop. | 600,000 | | 10 p. c. under Northampton | None | . . . . |
| Westminster . . | L | Mixed | | | Northampton | None | . . . . |

These companies may be considered as constituted on three different plans. The first is, where all the assurers for the whole term of life are mutually responsible. They participate in the profits, and are subject to calls to replace any loss or deficiency in the funds.* This responsibility, however, is merely nominal, as a large surplus fund must necessarily accumulate from the circumstances already noticed so highly favorable to the offices. A capital to commence with is wholly unnecessary, as the receipts continue to be annually paid in, and are placed at interest in the public securities, long before any large demands can take place, and there is no danger of losses occurring from bad debts. Of societies founded on this principle of mutual assurance, there are established in London the Amicable, Equitable, the London Life Assurance and Norwich Life, and in these the assurers are entitled to share in the profits; but they do not share in the whole of them, one-third being generally reserved.

The second principle on which institutions of this kind are founded, is that of a number of persons forming a company, and raising a capital among themselves, as a guarantee for the payment of all contracts or policies which they may effect. Security to the assured, and freedom from responsibility, are the supposed advantages held out by this plan; in consideration of which the rates charged are generally as high as the preceding, though the exact sums only, named in the policies, are paid on the deaths of the parties, without additions or deductions. The offices which have adopted this plan are the Albion, British Commercial, Eagle, Globe, London Assurance, Pelican, Royal Exchange, Sun, West of England, Westminster. Whatever advantages may be supposed to attach to these offices, the assurer most undoubtedly pays very high for a security, that is merely nominal, or at least unnecessary; but we suppose the greater number of the assurers are proprietors, and as such share in the profits of the concern.

The third principle consists of a combination of these two. The proprietors subscribe a capital, relieve the assured from all loss, and responsibility, take one portion of the profits to pay the

interest of the capital, and give the assured, at certain intervals, the remainder. The Rock, the Alliance, the Guardian, the Palladium, and some others, are founded on this principle, which is, perhaps, as good as any other, though it curtails the amount of the additions which would otherwise be made to those assurers who are not proprietors, or holders of shares.

From a table given by Mr. Morgan, the actuary of the Equitable, formed from above 150,000 instances, Mr. Babbage concludes that forty-seven is about the average age at which persons assure; that is to say, as many persons assure later in life than this age, as under it; that about one-third commence between forty and fifty—nine-tenths between thirty and seventy; that about one-fifteenth of the whole are under twenty when they commence; that on a life aged forty-six, the profits per cent on the premiums demanded by the several following offices, are as follows:

| | £. | s. |
|---|---|---|
| Alliance . . . . | 30 | 2 |
| Amicable . . . . | 25 | 5 |
| British Commercial . . | 16 | 6 |
| Crown . . . . | [illegible]5 | 5 |
| Economic . . . . | [illegible] | 2 |
| Equitable . . . . | 2[illegible] | 2 |
| European . . . . | 2[illegible] | 5 |
| Guardian . . . . | 25 | 1 |
| London Assurance . . | 26 | 7 |
| Medico-Clerical . . . | 29 | 7 |
| Norwich Union . . . | 19 | 3 |
| Sun . . . . . | 30 | 9 |
| United Empire . . . | 21 | 9 |
| University . . . . | 23 | 2 |
| West of England . . | 16 | 2 |

Before, however, we can judge accurately of the comparative advantages to the assurers, this table must be viewed in conjunction with the proportion of those profits which is returned to them in the shape of a bonus; the mode of assigning that proportion; the periods at which it is so assigned; and the periods at which the assurers become entitled to participate in those profits.

Mr. Babbage says, that the only two companies (and they are those which probably rank highest in public estimation and importance) that have yet assigned a bonus to the assured, by adding a certain per centage to the amount of the policies, are the Equitable and the Rock. In this, we apprehend, he must be mistaken; at least, he is inconsistent with his own statement, wherein he had just told us that all but the ten proprietary companies profess to make certain returns of their profits; perhaps, however, they may not yet have made a commencement of fulfilling their professions. The Rock is a young establishment compared with the former, and only made its first dividend of profits in the year 1819, thirteen years after its establishment, when it is stated to have added twenty per cent. to those policies which had existed ten years. The Equitable, at various periods since the year 1782, and in two periods of ten years each ending in 1820, added to each policy, existing at the former date, 185 per cent., the average addition of ten years being £23 2*s*. 6*d*. per cent. The conclusion drawn from this comparison is important.

'A difference of £3 2*s*. 6*d*. on £20, or nearly one-sixth between two offices, may not appear very great; and it may perhaps be expected that, on a larger experience, they will approximate much more nearly to each other. That there are very sufficient reasons why this cannot be the case, and that the relative advantages of the two offices are not truly estimated by the numbers 20, and 23⅛, I shall now proceed to show. In order to render this matter, which is of considerable importance, more clear, I shall suppose two assurance offices to commence at the same time, one on the plan of the Equitable, the other on that of the Rock and some others; that each makes by its business a clear profit of £300,000 every ten years; each office awards two-thirds of the profits to the assured, but one of them, immediately on each division, transfers one-third of the profits to a body of proprietors.

'By tracing the progress of these offices through a considerable period of years, we shall see the important result produced by the deduction of one-third of the profits for the payment of those who guarantee the capital.

At the end of the first ten years, both offices divide a profit of £300,000, and two-thirds of this are added to the policies of the assurers at both offices; but at the Equitable, the other third increased during the next ten years, suppose it only at three per cent., amounts to £134,392; and at the second division, the profits of the Equitable are greater than those of the other office by this sum.

'The following table will show the sums added, at intervals of ten years, by an office on the plan of the Equitable:—

| | |
|---|---|
| At the end of the first ten years . . | £200,000 |
| At the end of the second ten years . | 289,595 |
| At the end of the third ten years . . | 329,730 |
| At the end of the fourth ten years . . | 347,709 |
| At the end of the fifth ten years . . | 355,764 |
| At the end of the sixth ten years . . | 359,373 |

'Whilst at an office in which one-third of the profit is paid to proprietors, the constant sum of £200,000 can only be added at the decennial period of division; and, in the course of sixty years, the assurers have received additions of nearly £682,000 at one office above those given by the others.

'Nor is this the whole difference; for although two-thirds is the sum nominally divided amongst the assured, since that sum is only payable on the death of their respective nominees, it is not really equal to two-thirds, and is, in fact, different for different ages. Thus suppose three assurers of the ages of twenty, thirty-five, and sixty, and that £100 is the addition awarded to each of their policies, the present value of that sum to each of these parties is £34 9*s*. 9*d*., £42 3*s*. 1*d*. and £61 7*s*. 9*d*., respectively; and even when the same sum is added to a policy on a life aged eighty, it is worth in present money only £82 2*s*. 10*d*.; this inequitable mode of apportioning them is not however so disadvantageous in a system of mutual assurers, because the reserved surplus again accumulates for the benefi of the assured at the next period of division.

'These facts show that the two-thirds, apparently given to the assured, are in reality not equal to one-half the total profits; at the same time they explain the cause of the large additions made at the Equitable, and show that it cannot be expected that any of an equal extent can ever be made by any society burdened with a permanent proprietary.'

It is deserving of notice, that up to the year 1820, the Equitable added to a policy of twenty years' date, 77 per cent; to one of thirty years' date, 161 per cent; to one of forty years' date, 280 per cent.; and to one of fifty years' date, 401 per cent.

It would be tedious to give an abstract even of what the various offices promise to do with the profits. The following, however, is a summary of about one-half of them, as given by Mr. Babbage:—

| | |
|---|---|
| Equitable, Rock, Provident, Union, | added to policies. |
| Alliance, Guardian, | added to policy, or applied to diminish premium. |
| Norwich Union, Provident, United Empire, | added to policies in proportion to amount of premiums paid. |
| Economic, European, | added to policies and interest on bonus paid annually. |
| Atlas, Law Life, | a reversionary sum equal to present bonus added to policy. |
| London Life, | applied to diminish premium, or paid immediately. |
| Amicable, | a sum equal to the average annual payment, received by the society during the last five years, divided amongst those who die in every year. |
| Palladium, | added to policies on the most equitable principles of division. |
| Hope, Imperial, | unknown. |

'Those offices which merely add the bonus to the policy are wrong on both the grounds which interest the public. In the first place, they appear to give as a bonus a larger proportion than they in reality do give, and they also distribute that bonus very unequally; the older lives having a much larger portion than the younger. In some cases, an old life will receive twice as much as a young one, and yet the same rate per cent is awarded to each.'

The following table shows the periods at which the division of profits takes place at the respective offices mentioned therein:—

| | |
|---|---|
| Alliance, Asylum, United Empire, | five years. |
| Medical and Clerical, | five or seven years. |
| Equitable, | ten years. |
| Crown, Economic, Hope, Imperial, Law Life, | unknown. |
| Amicable, London Life, | yearly. |
| Atlas, European, Guardian, Norwich Union, Palladium, Rock, Provident, Union: | seven years. |

See ASSURANCE.

We shall add to these statistical details whatever may seem necessary to give a complete picture of the existing state of the empire under the article GREAT BRITAIN.

## PART II.

### HISTORY OF ENGLAND.

1. *Of England under the Anglo-Saxons.*—We have seen (article BRITAIN) the entire success of the arms of Egbert. The kingdoms of the Heptarchy that were allowed to retain their name had lost all independent existence; and Egbert became sole master of England about the year 827. A favorable opportunity was now offered to the Anglo-Saxons of becoming a civilised people, as they were at peace among themselves, and seemed free from any danger of a foreign invasion. But this flattering prospect was soon overcast. Five years after Egbert had established his new monarchy, the Danes plundered the isle of Sheppey, and made their escape with safety. Encouraged by this success, next year they landed from a fleet of thirty-five ships. They were encountered by Egbert at Charmouth in Dorsetshire. The battle was obstinate and bloody. Great numbers of the Danes were killed, but the rest made good their retreat to their ships. They next entered into an alliance with the Britons of Cornwall; and, landing two years after in that country, made an irruption into Devonshire. Egbert met them at Hengesdown, and totally defeated them; but before he had time to form any regular plan for the defence of the kingdom, he died, and left the government to his son Ethelwulf. The reign of Egbert on the whole was most fortunate and glorious. Dr. Lingard contends, however, that there is not sufficient authority for supposing that he gave himself the title of the first king of England, and thinks that Henry of Huntingdon means by Monarcha Britannicus nothing more than 'Bretwalda,' a title which the most eminent and powerful of the princes of the Saxon Hep-

tarchy had long borne. It is clear, however, according to the admission of this writer, that he extended the authority of his original kingdom of Wessex over the far greater part of the island.

The new king was weak and superstitious. He began with dividing the kingdom, which had so lately been united, with his son or brother Athelstan. To the young prince he gave the counties of Essex, Kent, and Surrey; a division which, though it might have been productive of bad consequences at another time, was perhaps in part adopted for safety, and through fear of the Danes. These piratical barbarians impelled by the hope of plunder, scarcely ever failed of paying England an annual visit; and, though they met with many previous repulses, had on the whole gained sufficient ground in 851 for a body of them to take up their winter quarters in England. Next year they received a strong reinforcement of their countrymen in 350 vessels; and advancing from the isle of Thanet, where they had stationed themselves, they burnt London and Canterbury. Having next put to flight Brithric the governor of Mercia, they marched into the heart of Surrey, laying waste the whole country through which they passed. Ethelwulf, though little inclined or fitted for military enterprises, was now obliged to take the field. He marched against the Danes at the head of the West Saxons, and gained an indecisive and bloody victory over them; for the enemy still maintained a settlement in the isle of Thanet. They were also attacked by Ealher and Hudda, governors of Kent and Surrey; both of whom they defeated and killed. Afterwards they removed to the isle of Shepey, where they took up their winter quarters, with a design to extend their ravages the next year. In this deplorable state of his kingdom Ethelwulf undertook a pilgrimage to Rome, whither he carried his fourth and favorite son Alfred, then only six years of age. Some of our historians state that this prince had been previously sent to Rome at the age of four under the care of the bishop of Winchester. Be this as it may he certainly accompanied his father at this time, and the pontiff Leo IV. is said at Ethelwulf's desire to have conferred on him the royal unction with the ceremony of confirmation. Having passed a year at Rome Ethelwulf made a grant of 300 mancuses (about £37 10*s.* sterling) annually to the papal see. See MANCUS. On his return through France, he married Judith, daughter of the emperor Charles the Bald, who after the marriage, was crowned and seated on a throne beside her husband, at Rheims. This is the first instance of a female coronation in our history, and the West Saxons are said to have exhibited great distaste of the ceremony. When Ethelwulf landed in England, he found that his eldest son Ethelbald had conspired with the bishop of Sherburne, the ealdorman of Somerset, and others, to deprive him of the throne. Athelstan had died in the interim, and Ethelbald had in virtue of his deputed authority assumed the government of the provinces formerly committed to that prince. This strengthened his hands, and the monkish parent agreed to transfer to the heir apparent the kingdom of Wessex, and content himself with the eastern provinces formerly governed by Athelstan. Immediately after this he is said to have summoned the states of his kingdom, and conferred on the clergy a perpetual donation of tithes, for which they had contended for several centuries. It seems more probable, however, that this transaction, whatever it may in reality have amounted to, took place before his journey to Rome: as it clearly was from the first recognised throughout the kingdom of Wessex, and the grant was extended by a council held at Winchester (Lingard says in 855) to all the clergy of the Saxon nations. This concession was deemed so meritorious, that the people of both states now thought themselves secure of the favor of heaven; and therefore neglected to use the natural means for their safety. They even agreed, that, notwithstanding the desperate situation of affairs, the revenues of the church should be exempted from all burdens; even from those imposed for the immediate defence of their respective territories.

Ethelwulf died two years after his return, and left the kingdom of Kent by will to his second son Ethelbert, and that of Wessex to Ethelbald, Ethelred, and Alfred, in succession. Ethelbald now, therefore, continued to govern the kingdom of Wessex, and his brother Ethelbert was placed in possession of the eastern provinces. The former, who had strenuously objected to his father's marriage with Judith of France (then not more than twelve years of age), now gave his hand to the young widow; but his people were so scandalised at this incestuous match, that he was compelled to submit to a separation, and she retired to her native country. This lady's history is still further, however, connected with that of England: as through a subsequent marriage with Baldwin, the forester of France and earl of Flanders, she became the mother of Matilda, the wife of William I. and gave to this country a long line of kings.

Ethelbald survived his father about seven years, but no further transactions of his reign appear in our histories. By the unanimous consent of the great council of Wessex, though contrary as we have seen to his father's will, he was succeeded by his next brother Ethelbert, whose reign was, however, also short and uninteresting. But in his person the whole of his father's dominions were again united under one sceptre. The Danes or northmen, the year previous to his death, penetrated to the city of Winchester and plundered it; but were defeated on their retreat by the ealdormen of Hampshire and Berkshire. In Kent and the isle of Thanet, as well as in Northumbria, they were successful.

Ethelred I. succeeded to his brother in the year 866; and the whole of his reign was disturbed by the irruptions of the Danes. The king defended himself with great bravery, being seconded in all his military enterprises by his brother Alfred. In this reign, the Danes first induced the East Angles to enter into an alliance with them, and furnish them with horses, to make an irruption into Northumberland, where they seized upon York. Osbright and Ælla, two Northumbrian princes who attempted to rescue the city, were defeated and killed. Encouraged by this success, the northmen pene-

trated into Mercia, took up their winter quarters at Nottingham, and thus threatened the kingdom with a total subjection. From this post, however, they were dislodged by Ethelred and Alfred, who forced them to retire into Northumberland. Their restless disposition, however, did not suffer them to continue long in one place. They broke again into East Anglia; defeated and took prisoner Edmund the tributary king, whom they afterwards murdered; and committed every where the most barbarous ravages. In 871 they advanced to Reading; from whence they infested the neighbouring country by their incursions. The Mercians, desirous of recovering their independence, refused to join Ethelred with their forces; so that he was obliged to march against the Danes, attended only by the West Saxons, his hereditary subjects. Several actions ensued, in which the Danes were said to be unsuccessful; but, being continually reinforced from their own country, they became every day more and more formidable to the English. During the confusion and distress in which the nation was now involved, Ethelred died of a wound he had received, and left to his brother Alfred a kingdom almost totally subdued by foreigners.

Alfred ascended the throne in 871, being then only twenty-two years of age. His great virtues and shining talents saved his country from that ruin which seemed almost unavoidable. His exploits against the Danes, his dangers and general character, have already engaged our attention under the article Alfred. Having settled the nation in such a manner, that he may be justly esteemed the founder of the monarchy, as well as of the free constitution of England, he died in 901, leaving the kingdom to his second son Edward the elder. And here we may conveniently compare the comparative accuracy of Mr. Hume and Dr. Lingard. We have examined the authorities of the latter with regard to Alfred sufficiently to believe that whenever that prince is concerned, Mr. Hume is to be followed with caution. The splendid qualities of a prince who, in a barbarous age, and amid scenes of devastation, though constantly tortured by the agony of an inward disease, displayed a taste and an intellect so far above his contemporaries, have inspired the historian with a partiality which has blinded him to the defects of his idol. Alfred's conduct in the first years of his reign was far from blameless. He is accused of having given full scope to the indulgence of his passions. There is good authority for saying, that he neglected the administration of justice, and treated the complaints of his subjects with contempt. Even in the exercise of his military and political functions, negligence, as well as imprudence, may be traced. He was more than once surprised, and he more than once forgot himself, so far as to purchase with money that tranquillity which successful valor can alone procure. We mention these things, not to detract from the glory of that great prince, but to show how far Mr. Hume disregarded facts, in representing him as free from blemish. Alfred ripened with his years: adversity did not teach him in vain. He fled from his throne, only to re-ascend it more completely fitted for the discharge of all his duties. But the events which drove him from the throne appear, from the narrative of Hume, to be not a little mysterious. The sovereign of England—harassed indeed by foreign invaders, but exerting himself against them with success for several years, and not meeting with any signal disaster, all at once, without any great battle, without any cause assigned except the despair of his people, and no immediate reason for their despair, except the capture of Chippenham,—becomes a fugitive, seeking safety in woods and morasses. The apparent mystery which hangs over this revolution, disappears, when we keep in view three circumstances, which are generally overlooked. 1st. Alfred, in strict propriety of speech, was not king of England. Northumbria, Mercia, and East Anglia had retained a separate, though not independent, existence under Egbert. In the time of Ethelred, Northumbria and East Anglia were conquered by the Danes. In 874 Mercia had the same fate. The connexion of these provinces with the English crown was thus annihilated. Alfred's authority, therefore, never extended beyond the limits of Wessex, and perhaps some adjacent districts of East Anglia: so that it was not the king of England who was driven from his throne, but a king of Wessex, who had an enemy in the heart of his dominions, and was surrounded by enemies on every side. 2dly. Alfred's military operations had not been attended with that success, which the declamatory language of historians, leads us to ascribe to them. This is proved by the necessity, to which he often found himself reduced, of trying to buy a peace, and by the footing which Gothrun obtained in Essex. 3dly. The circumstance which was the immediate cause of the subversion of Alfred's throne was a military operation of Gothrun, by which the king was compelled to seek his personal safety in flight, all his followers were dispersed, and no means were left to his subjects of joining in any regular plan of defence. This event is one of the most curious in our history; we shall extract Dr. Lingard's account of it. 'This sudden revolution arose from the policy of Gothrun, the most artful of the Northmen. That chieftain, on his retreat out of Wessex, had fixed his residence at Gloucester, and rewarded the services of his veterans by dividing among them the lands in the neighbourhood. But, while this peaceful occupation seemed to absorb his attention, his mind was actively employed in arranging a plan of warfare, which threatened to extinguish the last of the Saxon governments in Britain. A winter campaign had hitherto been unknown in the annals of Danish devastation: after their summer expedition, they had always devoted the succeeding months to festivity and repose: and it is probable that the followers of Gothrun were as ignorant as the Saxons of the real design of their leader. On the first days of the year 878 they received an unexpected summons to meet him on horseback at an appointed place: on the night of the 6th of January they were in possession of Chippenham, a royal villa on the left bank of the Avon. There is reason to believe that Alfred was in the place when the alarm was given: it is certain that he could not be at any great distance. From Chippenham Gothrun dispersed his cavalry in different directions over the neigh-

bouring counties: the Saxons were surprised by the enemy before they had heard of the war: and the king saw himself surrounded by the barbarians without forces and almost without attendants. At first he conceived the rash design of rushing on the multitude of his enemies; but his temerity was restrained by the more considerate suggestions of his friends, and he resolved to reserve himself for a less dangerous and more hopeful experiment. To elude suspicion, he dismissed the few thanes who were still near his person, and endeavoured, alone and on foot, to gain the centre of Somersetshire. There he found a secure retreat in a small island, situated in a morass formed by the conflux of the Thone and the Parret, which was afterwards distinguished by the name of Ethelingey, or Prince's Island.

'Though the escape of Alfred had disappointed the eager hopes of the Danes, they followed up their success with indefatigable activity. The men of Hampshire, Dorset, Wilts and Berkshire, separated from each other, ignorant of the fate of their prince, and unprepared for any rational system of defence, saw themselves compelled to crouch beneath the storm. Those who dwelt near the coast, crossed with their families and treasures to the opposite shores of Gaul; the others sought to mitigate by submission the ferocity of the invaders, and, by the surrender of a part, to preserve the remainder of their property. One county alone, that of Somerset, is said to have continued faithful to the fortunes of Alfred: and yet, even in the county of Somerset, he was compelled to conceal himself in the fens, while the ealdorman Æthelnoth with a few adherents wandered in the woods.'

Mr. Hume is scarcely less inaccurate in narrating the steps by which Alfred re-ascended the throne. He tells us the story of Alfred's disguise as a harper, under which he entered the Danish camp, and remained for some days in the tent of Gothrun. The tale is pretty, but it was unknown to Alfred's contemporaries, and appeared for the first time two centuries after his death. Mr. Hume represents the Danes as taken by surprise, and as submitting almost without resistance; 'taking advantage of his previous knowledge of the place,' says Mr. Hume (vol. i. p. 83), 'he directed his attack against the most unguarded quarter of the enemy. The Danes, surprised to see an army of English whom they considered as totally subdued, and still more astonished to hear that Alfred was at their head, made but a faint resistance, notwithstanding their superiority of numbers, and were soon put to flight with great slaughter.' Dr. Lingard shows that they were not surprised, and that they fought with desperate valor. See *Lingard*, vol. i. p. 186.

The beginning of Edward's reign was disturbed by those intestine commotions from which the wise and politic Alfred had taken so much pains to free the nation. Ethelwald, son to king Ethelbert, claimed a right to the throne, and took possession of Winburne, where he seemed determined to hold out to the last extremity. On the approach of Edward, however, with a powerful army, he first fled into Normandy, and afterwards into Northumberland, where the Danes, lately subdued by Alfred, but very impatient of peace, readily declared for him. Ethelwald having thus connected himself with the Danish tribes, went to Denmark, whence he returned with a great body of these banditti, and was joined by the Danes of East Anglia and Mercia. He made an irruption into Gloucester, Oxford, and Wilts; and, having ravaged the country, retired with his booty before the king could approach him. Edward revenged himself by leading his forces into East Anglia, and ravaging it in like manner He then ordered his army to retire: but the Kentish men, greedy of plunder, staid behind, and took up their quarters at Bury. Here they were assaulted by the Danes; but made so obstinate a defence, that though their enemies gained the victory, it was bought by the loss of their bravest men, and among the rest of the usurper Ethelwald. The king, now freed from the attempts of so dangerous a rival, concluded an advantageous peace with the East Angles. He next engaged in reducing the Northumbrians, and for this purpose equipped a fleet, when the latter thinking the whole of the king's forces were on ship-board, entered his territories with all their troops. The king, however, was better prepared than they expected. He attacked them on their return at Tetenhall, in Staffordshire, put them to flight, recovered the booty, and pursued them with great slaughter into their own country. The rest of Edward's reign was a scene of continued and successful actions against the Northumbrians, East Angles, the Danes of Mercia, and others from Denmark. He fortified Chester, Eddesbury, Warwick, Cherbury, Buckingham, Towcester, Maldon, Huntingdon, and Colchester, and vanquished the celebrated Thurketil, a Danish chieftain whom he obliged to retire into France. He also subdued the East Anglians, Northumbrians, and several tribes of the Britons; and even obliged the Scots to make submissions. He died in 925, and was succeeded by Athelstan his natural son.

This prince ascended the throne without much opposition, as the legitimate children of Edward were too young to rule a nation so much exposed both to foreign invasion and domestic broils. The etheling Alfred, however, a nobleman of considerable power, entered into a conspiracy against him. It is said, that this nobleman was apprehended upon strong suspicion only, but without any certain proof. He offered to swear to his innocence before the pope; and in those days it was supposed that none could take a false oath in presence of such a sacred person, without being visited by an immediate judgment from God. Alfred was accordingly conducted to Rome, and took the oath required of him before pope John X. The words were no sooner pronounced, we are told, than he fell into convulsions, of which he expired in three days. The king, fully convinced of his guilt, confiscated his estate, and made a present of it to the monastery of Malmesbury. This accident proved the means of establishing the authority of Athelstan in England. But finding the Northumbrians bore the English yoke with impatience, he gave Sithric, a Danish no-

bleman, the title of king of Northumberland; and, to secure his friendship, gave him his own sister Editha in marriage. This was productive of bad consequences. Sithric died the year after his marriage with Editha; upon which Anlaf and Godfrid, Sithric's sons by a former marriage, assumed the sovereignty without waiting for Athelstan's consent. They were, however, soon obliged to yield to the superior power of that monarch. The former fled to Ireland; and the latter to Scotland, where he was protected by king Constantine III., who was importuned by Athelstan to deliver up his guest, and even threatened with an invasion if he did not comply. Constantine, detesting such treachery, advised Godfrid to make his escape. He did so, turned pirate, and died soon after. Athelstan, resenting this conduct of Constantine, invaded Scotland, and reduced him, it is said, so low, that he was obliged to make the most humble submissions. This, however, is denied by all the Scottish historians. Constantine, after the departure of Athelstan, entered into a confederacy with Anlaf, who subsisted by his piracies, and with some of the Welsh princes who were alarmed at the increase of Athelstan's power. The confederates made an irruption into England at once; but Athelstan meeting them at Brunanburgh, or Brumbsbury in Northumberland, gave them a total overthrow. Anlaf and Constantine made their escape with difficulty, leaving the greater part of their men dead on the field of battle. After this period, Athelstan enjoyed his crown in tranquillity. He passed a remarkable law, for the encouragement of commerce; viz. that a merchant who had made three long voyages on his own account, should be admitted to the rank of a thane or gentleman; and died in 941, after reigning sixteen years.

He was succeeded by his brother Edmund I. On his accession he found the kingdom disturbed by the restless Northumbrians, who were, however, soon reduced; and Edmund ensured the peace of the kingdom, by removing the Danes from Mercia, where they had been allowed to settle, as he found they took every opportunity to introduce their countrymen into the kingdom. He also conquered Cumberland from the Britons. This country, however, he bestowed upon Malcolm king of Scotland, upon condition that he should do homage for it, and protect the north of England from all future incursions of the Danes. Edmund was unfortunately murdered in Gloucester by one Leolf a notorious robber. This man had been formerly sentenced to banishment; yet had the boldness to enter the hall where the king himself dined, and to sit at table with his attendants. Edmund immediately ordered him to leave the room. The villain refused to obey; upon which the king leaped upon him, and seized him by the hair. Leolf then drew a dagger, and gave the king a wound, of which he instantly died, A. D. 946, in the sixth year of his reign.

As the children of Edmund were too young, his brother Edred succeeded to the throne. The beginning of his reign, as well as those of his predecessors, was disturbed by the rebellions and incursions of the Northumbrian Danes. On the appearance of Edred with an army, however, they immediately submitted; but before the king withdrew his forces, he laid waste their territories by way of punishment. No sooner had he departed, than they rose in rebellion a second time. They were again subdued; and the king took effectual precautions against their future revolts, by placing English garrisons in all their towns, and appointing an English governor to watch their motions, and suppress their insurrections. In the reign of Edred, the celibacy of the clergy first began to be preached under the patronage of Dunstan. This pretended saint had obtained such an ascendancy over Edred, who was naturally superstitious, that he not only directed him in affairs of conscience, but in the most important matters of state. He was placed at the head of the treasury; and, being thus possessed of great power at court, was enabled to accomplish the most arduous undertakings. Professing himself a partisan of the most rigid monastic rules, and having introduced celibacy among the monks of Glastonbury and Abingdon, he endeavoured to render it universal among the clergy throughout the kingdom. The monks generally embraced the pretended reformation; after which they inveighed bitterly against the vices and luxury of the age. When other topics of defamation were wanting, the marriages of clergymen became a sure object of invective. Their wives received the appellation of concubines, or some other more opprobrious name. The secular clergy, on the other hand, who were numerous and rich, defended themselves with vigor, and endeavoured to retaliate upon their adversaries. The people were thrown into the most violent ferments; but the monks, being patronised by Edred, gained ground greatly upon their opponents. Their progress, however, was somewhat retarded by the king's death, which happened in 955 after a reign of nine years. He left children; but, as they were infants, his nephew Edwy, son to Edmund, was placed on the throne

The new king was not above sixteen or seventeen years of age, at his accession. His reign is only remarkable for the tragical story of his queen Elgiva. She was a princess of the royal blood, with whom Edwy was deeply enamoured, but, being his second or third cousin, was within the degrees of affinity prohibited by the canon law. Edwy, however, hearkening only to the dictates of his passion, married her, contrary to the advice of the more dignified ecclesiastics. The monks on this occasion were particularly violent; and Edwy therefore determined not to second their ambitious projects. But he soon found reason to repent his having provoked such dangerous enemies. On his coronation day, while his nobility were indulging themselves in riotous mirth in the hall where they had assembled, Edwy withdrew to another apartment, to enjoy the company of his beloved queen and her mother. Dunstan guessed the reason of his absence; with unparalleled assurance he burst into the queen's apartment; and upbraiding Edwy with his lasciviousness, as he termed it, pushed him back into the hall where the nobles were assembled. The king determined to resent such a daring insult. He required from Dunstan an account of the administration of the treasury

during the late reign. The monk, probably unable to give a just account, refused to give any; upon which Edwy accused him of malversation in his office, and banished him the kingdom. We have noticed the general accuracy of our modern historian Dr. Lingard. On this subject, in a previous article (see DUNSTAN), we presumed to question it: and, on reflection must consider his whole account of this ecclesiastic as tainted with prejudice and grossly partial to his own church. He is introduced to us as a young thane, whose thoughts a dangerous sickness turned from worldly pursuits to the monastic state, and whose zeal, disinterestedness, and charities, while he served the church of Glastonbury, attracted public notice. Not a word is uttered concerning the early licentiousness of which he is accused; nay, the prudence of his biographer robs him of the glory of all those exploits, which gave him his power while he lived, and after his death placed him on the list of the saints. Why are we not told of the cell in which he secluded himself from the world? a cell in which he could neither stand erect, nor stretch out his limbs during repose. Why is the noted adventure of the devil and the red-hot pincers passed over in total silence? These circumstances are essential to a faithful picture of the age and of the individual; and they stand upon authority, which Dr. Lingard in other cases deems unobjectionable. Why then are they omitted? Because in the present day they would not contribute to Dunstan's fame. Again, the synod which met at Colne to discuss the keenly agitated question concerning the pretensions of the monastic orders, the floor fell in; some were killed, many were hurt: the beam on which Dunstan's chair stood, was the only one that did not give way. These facts Dr. Lingard admits: but he blames the historians who suspect and accuse Dunstan as the author of the catastrophe. The charge, he says, is a mere fiction. It is no fiction. It is only an inference; and, whether it be just or not, is a fair subject of dispute. Dr. Lingard's zeal for the reputation of Dunstan has led him to give a new coloring to the transactions of Edwy's reign. He has corrected Hume in some minute particulars; yet, upon the whole, the general features of Edwy's story are delineated by that author more faithfully than by Dr. Lingard.

On Dunstan's departure the whole nation was in commotion about his sanctity, and the king's impiety. These clamors as they had been begun, so they were kept up and increased by the clergy, till at last they proceeded to the most outrageous violence. Archbishop Odo sent a party of soldiers to the palace. They seized the queen, and burnt her face with a red-hot iron; after which they carried her by force into Ireland, there to remain in perpetual exile. The king, finding it in vain to resist, was obliged to consent to a divorce from her, which was pronounced by Odo. A catastrophe still more dismal awaited Elgiva. She had been cured of her wounds, and had even found means to efface the scars with which her persecutors had hoped to destroy her beauty. She then came to England, with a design to return to the king, whom she still considered as her husband. Unfortunately, however, she was intercepted by a party of soldiers sent for that purpose by the primate. Nothing but her most cruel death could now satisfy this wretch and his accomplices. She was hamstringed at Gloucester, and expired in a few days. The minds of the English were at this time so much sunk in superstition, that the monstrous inhumanity above mentioned was called a judgment from God upon Edwy and his spouse for their dissolute life, i. e. their virtuous love to each other. They even proceeded to rebellion against their sovereign; and having raised to the throne Edgar, the younger brother of Edwy, at that time only thirteen years of age, they soon put him in possession of Mercia, Northumberland, and East Anglia. Edwy being thus confined to the southern counties, Dunstan returned, and took upon him the government of Edgar and his party; but the death of Edwy soon removed all difficulties, and gave Edgar peaceable possession of the government. Dr. Lingard's view of the events subsequent to Dunstan's exile is thus given:—'Soon after this transaction Edwy appears to have married, an event which might have been expected to put an end to the connexion between him and his mistress. Whether on that occasion Ethelgiva was committed to the care of her relations or of her husband, we are ignorant; but the king, either instigated by his passion, or moved by her solicitations, carried her off by force, and placed her in one of the royal farms. Archbishop Odo undertook to remove the scandal, by enforcing the punishment which the laws awarded against women living in a state of concubinage. Accompanied by his retainers, he rode to the place, arrested Ethelgiva, probably in the absence of her lover, conducted her to the sea-side, and put her on board a ship, in which she was conveyed to Ireland. At his return to court he waited on Edwy, and in respectful and affectionate language endeavoured to justify his own conduct, and to sooth the exasperated mind of the young prince.' (pp. 234, 235). Elgiva or Ethelgiva, is here provided with a husband of whom history knows nothing. This writer, indeed, supposes the mother to have been the object of Edwy's attachment, and, as she had a daughter, he is entitled to infer that she once had a husband. But history makes no mention of this husband: he might have been dead at the time of Edwy's accession. The supposition, that it was the mother whom Edwy loved, is so far as we know unwarranted. Dr. Lingard gives us no authority for it: and in the absence of clear proof to the contrary, we are entitled to hold that a youth of seventeen or eighteen was more likely to become enamoured of the daughter than of the mother. Two other important circumstances, quite new in history, are also contained in this passage; the marriage of Edwy, and his carrying off Elgiva by force. They rest upon the authority of two passages in two manuscript lives of St. Oswald, the one anonymous, the other written about ninety years after Eadmer by Senatus, prior of Worcester. The anonymous writer says, 'Rex, sub uxore propria alteram adamavit, quam et rapuit.' The words of Senatus are, 'Rex exarsit in quandam, quam spreta fide tori subintroductam habebat;' and then he

goes on to mention Dunstan's opposition and banishment. These authorities seem the weakest that could be imagined. The force used against Elgiva is hinted at only by the anonymous biographer of Oswald; and the words of Senatus 'spreta fide tori' are vague enough to admit of more than one interpretation. There is no specification of person in either; so that the authors appear to have had no accurate knowledge of what they pretend to relate. If Senatus be interpreted as insinuating that Edwy was married, then, contrary to Dr. Lingard's narrative, this marriage preceded the banishment of Dunstan; and Edwy must be supposed to have involved himself without any reason in a matrimonial engagement, at the very moment he was so violently attached to another as to forget every ordinary calculation of prudence. The supposition of his carrying off Elgiva by force is altogether inconsistent with acknowledged facts. Elgiva's feelings and circumstances were not such as to render violence necessary. To make force requisite, she must have been in the custody of Dunstan's faction: and we know that she was not in their power, till Odo sent her to Ireland. From the nature of the case, therefore, as well as from the weakness of the evidence adduced, we cannot admit, that Edwy carried off Elgiva by force, or that he was married to another. And we are confirmed in this conclusion by considering, that neither of these circumstances has been mentioned by the monkish historians of the age. Their silence on such topics is decisive. Had it been possible to have magnified any of Edwy's failings into the crime of adultery, they would not have spared him and his mistress that reproach. It is remarkable too how gently the outrage of Odo is represented as being 'an endeavour to enforce the law.'

The reign of Edgar, proved one of the most fortunate in the English history. He took the most effectual methods both for preventing tumults at home and invasions from abroad. He quartered a body of disciplined troops in the north, to repel the incursions of the Scots, and to keep the Northumbrians in awe. He built a powerful navy; and that he might keep the seamen in the practice of their duty, as well as present a formidable front to his enemies, he commanded the fleet from time to time to make the circuit of his dominions. The greatness of Edgar, which is much celebrated by our historians, is mainly to be attributed to the harmony which reigned between him and his subjects; and the reason of this perhaps was, that he espoused all the measures suggested by Dunstan and the monks, who had acquired a great ascendancy over the people. He enabled them to accomplish their favorite scheme of dispossessing the secular canons of the monasteries, and consulted them not only in ecclesiastical, but also in civil affairs. On these accounts he is celebrated by the monkish writers with the highest praise: though it is plain, from some of his actions, that he was a man who could be bound neither by the ties of religion nor humanity. He broke into a convent, and carried off by force a nun of the name of Editha. His spiritual instructor, Dunstan, for this offence, obliged the king, not to separate from his mistress, but to abstain from wearing his crown for seven years; Edgar, however, was not to be satisfied with one mistress. Happening to lodge at the house of a nobleman who had a very beautiful daughter, he without ceremony asked her mother to allow the young lady to pass a night with him. She promised compliance: but secretly ordered a waiting maid, named Elsteda, to steal into the king's bed when the company were gone, and to retire before day-break. Edgar, however, detained her by force, till day-light discovered the deceit. His love is said to have been now transferred to this girl; who became his favorite mistress, and maintained great ascendancy over him till his marriage with Elfrida. The circumstances of this marriage were yet more criminal than those above mentioned. Elfrida was daughter and heiress to the earl of Devonshire. The fame of her exquisite beauty was spread over all England; and Edgar formed a design of marrying her. He communicated his intention to earl Athelwold his favorite; and ordered him to visit the earl of Devonshire, and give him an opinion of Elfrida. Athelwold went as he was desired; but fell so deeply in love with the young lady, that he resolved to sacrifice his fidelity to his passion. He returned to Edgar and reported, that her charms were by no means extraordinary, and would have been totally overlooked in a woman of inferior station. He observed, however, that he thought her parentage and fortune made her a very advantageous match; and therefore, if the king gave his consent, he would himself make proposals to her father. Edgar consented, and Athelwold was married to Elfrida. After this event he used his utmost efforts to keep his wife from court, that Edgar might have no opportunity of observing her charms. The king, however, soon informed of the truth, told Athelwold that he intended to pay him a visit, and to be made acquainted with his new wife. The earl could make no objection; he only desired a few hours to prepare his house; and, confessing the whole intrigue to Elfrida, begged of her not to attempt to exert her influence over the king. The lady, however, was not so easily reconciled to being duped of a crown: she is said to have taken particular pains at the toilet, and Edgar immediately conceived a violent passion for her. To gratify it he seduced Athelwold into a wood, under pretence of hunting, where he stabbed him with his own hand, and afterwards married his widow. The reign of this tyrant is remarkable for the great encouragement it offered to foreigners to settle in the realm. They corrupted, it is alleged, the former simple manners of the nation: but of this there seems to be no great reason to boast. Their more extended intercourse certainly tended to enlarge their views, and cure them of illiberal prejudices and rustic manners. Another remarkable incident of this reign is, the extirpation of wolves from England. The king took great pleasure in hunting and destroying these animals. At last he found they had taken shelter in the mountains and forests of Wales. Upon this he changed the tribute imposed upon the Welsh princes by Athelstan, into an annual tribute of 300 wolves' heads; which produced such diligence in hunting them, that they were at last ex-

terminated. Edgar died in 958, after a reign of sixteen years.

He left a son, Edward, whom he had by his first wife the daughter of earl Ordmer; and another named Ethelred, by Elfrida. She proved, as might have been expected, ambitious, haughty, treacherous, and cruel. The principal nobility, therefore, were greatly averse from the succession of her son Ethelred, which would unavoidably throw considerable power into the hands of his mother, as he was only seven years of age. Edward was therefore selected for the prince, at fifteen years of age. But Elfrida opposed his advancement with all her influence; until Dunstan overcame every obstacle, by anointing and crowning him at Kingston; upon which the whole kingdom submitted to his authority. The only remarkable occurrence in this reign was the final victory obtained by the monks over the secular clergy, who were now expelled from the convents. Though this had been nearly accomplished by Edgar, the secular clergy had still those partisans in England who made considerable opposition; but these were not silenced by the pretended miracles, and authority of Dunstan. Edward lived four years after he was raised to the throne, in perfect submission to his council at the head of which were the ecclesiastics. Incapable of any treacherous intention himself, he suspected none in others. Though his stepmother, in particular, had opposed his succession, he had always behaved towards her with the greatest respect; and expressed on all occasions great affection for his brother Ethelred. Being one day hunting in the neighbourhood of the castle where Elfrida resided, he paid her a visit unattended by his retinue: and, after mounting his horse to return, requested some liquor to be brought him. While he was holding the cup to his head, we are told, a servant of Elfrida stabbed him behind. The king, finding himself wounded, clapped spurs to his horse; but soon becoming faint, from the loss of blood, he fell from the saddle, and his foot being entangled in the stirrup he was dragged along till he expired. His body was found by his attendants, and privately interred at Wareham. His subjects bestowed upon this amiable prince the appellation of martyr, and fancied that miracles were wrought at his tomb. Elfrida built monasteries, and submitted to many penances to atone for her guilt; but even in that barbarous age she could never regain the good opinion of the public.

After the murder of Edward, his brother Ethelred II. succeeded to the throne without opposition. As he was a minor, the Danes began to renew their incursions. They first, in 981, landed at Southampton from seven vessels; and, having ravaged the country, retired with impunity carrying a great booty with them. In 987 they made a similar attempt on the west coast, which was attended with success. Thus encouraged they landed in Essex, and, having defeated and killed Crithnot a prince of that county, laid waste all the neighbouring provinces. In this extremity Ethelred, surnamed, on account of his preposterous conduct, the Unready, bribed the enemy with £10,000 to depart the kingdom; according to advice said to have been given to him by Siricius archbishop of Canterbury, and some of the degenerate nobility. It was attended with the success that might have been expected. The Danes appeared next year off the eastern coast. But, in the mean time, the English had determined to assemble, at London, a fleet capable of repulsing the enemy, and only failed of success through the treachery of Alfric duke of Mercia. Having been formerly banished the kingdom, and finding great difficulty in getting himself restored to his former dignity, he now trusted not to his services or the affections of his countrymen, but to the influence he had over his vassals, in the midst of the public calamities. These he seemed determined to promote as far as he could. The English had formed a plan for surrounding and destroying the Danish fleet; when Alfric not only gave the enemy notice of the design, but deserted with his squadron the night before the engagement. Ethelred, in revenge, took Alfgar, Alfric's son, and ordered his eyes to be put out. It was found, however, impossible to deprive Alfric of the government of Mercia. In 993 the Danes under the command of king Sueno, or Sweyn, and the Norwegians conducted by Olaus, sailed up the Humber, and destroyed all around them. A powerful army was assembled to oppose these invaders; but through the treachery of the three leaders, all men of Danish extraction, the English were totally defeated.

Encouraged by constant success, the Danes at length entered the Thames in ninety-four vessels, and laid siege to London. The inhabitants, however, made a brave defence, and the besiegers were obliged to retire. In revenge they laid waste Essex, Sussex, and Hampshire; and, seizing the horses of these districts, were enabled to penetrate into the more inland counties, and threatened the entire kingdom with subjection. Ethelred and his nobles had now recourse to their former expedient. They sent ambassadors to the two northern kings, to whom they promised subsistence and tribute, provided they would, for the present, put an end to their ravages and depart the kingdom. These terms were agreed to, and the Danes peaceably took up their quarters at Southampton. Olaus even paid a visit to Ethelred, and received the rite of confirmation from the English bishops. The king also made him many presents; and Olaus promised never more to molest the English territory; which promise he religiously observed. After the departure of Olaus with his Norwegians, Sueno, though less scrupulous, was obliged also to leave the kingdom. But this compromise procured only a short relief. The Danes soon re-appeared in the Severn, and having ravaged Wales, as well as Cornwall and Devonshire, sailed round, and, entering the mouth of the Tamar, completed the ruin of the two counties. Then, returning to the Bristol Channel, and penetrating into the interior by the Avon, they carried fire and sword into Dorsetshire. In 998 they changed the seat of the war, and, after ravaging the Isle of Wight, entered the Thames and Medway, where they laid siege to Rochester, and defeated the Kentish men. After this victory the whole province was made a scene of slaughter and devastation. These miseries forced the English to consult for com-

mon defence; but the weakness of the king, the divisions among the nobility, the treachery of some, the cowardice of others, and the want of concert in all, frustrated every endeavour; and their fleets and armies either came too late to attack the enemy, or were repulsed with disgrace. Devoid both of prudence and unanimity, they once more had recourse to their old expedient, and offered the Danes a large sum if they would conclude a peace and depart. These ravagers now required the payment of £24,000, which the English submitted to give, and thus procured a temporary relief. The Danes were also engaged by another motive to depart from England at this time. They were recalled by their countrymen in Normandy, who were hard pressed by Robert king of France, and found it difficult to defend their settlements against him. It is probable also that Ethelred, observing the close connexion of the Danes with one another, was desirous of procuring an alliance with that formidable people. For this purpose, being a widower, he paid his addresses to Emma, sister to Richard II., duke of Normandy. They were accepted; the princess came over to England, and was married to the king, A.D. 1001.

Though the Danes had been long established in England, and the similarity of their language with that of the Saxons had invited them to an early union with the natives; they had as yet found so little of civilised manners among the English, that they retained all their ancient ferocity, and valued themselves only on their character for bravery: and the English princes had been so well acquainted with their superiority in this respect, that Athelstan and Edgar had been accustomed to keep in pay large bodies of Danish troops. These mercenaries attained to such a height of *luxury*, according to the old English writers, that they combed their hair once a-day, bathed themselves once a-week, changed their clothes frequently, and by these effeminate arts, as well as by their military character, rendered themselves so agreeable to the fair sex, that they debauched the wives and daughters of many English families. They were of course also ready always to betray them to the foreign Danes, and to associate themselves with every straggling party which came from the continent. The animosities between the native English and the settled Danes, had, from these causes, risen to a great height; when Ethelred, from that barbarous policy commonly adopted by weak princes, resolved upon a general massacre of the latter. On November 13th, 1002, secret orders were despatched to commence this bloody business every where on the same day, and the festival of St. Brice, which fell on a Sunday, the day on which the Danes usually bathed themselves, was chosen for this purpose. His barbarous orders were executed with the utmost exactness. Neither sex nor age was spared. Even Gunilda, sister to the king of Denmark, who had married earl Paling, and had embraced Christianity, was, by the advice of Edric earl of Wilts, seized and condemned to death by Ethelred, after seeing her children and husband butchered before her face. This unhappy princess, in the agonies of her despair, foretold that her murder would soon be avenged by the total ruin of the English. On the subject of this massacre, Mr. Hume says, 'Almost all the ancient historians speak of this massacre of the Danes as if it had been universal, or as if every individual of that nation throughout England had been put to death. But the Danes were almost the sole inhabitants in the kingdoms of Northumberland and East Anglia, and were very numerous in Mercia. This representation of the matter seems highly improbable. Great resistance must have been made, and violent wars ensued, which was not the case. The account given by Wallingford, though he stands single, must be admitted as the only true one. We are told that the name of lurdane, lord Dane, for an idle lazy fellow, who lives at other people's expense, came from the conduct of the Danes who were put to death. But the English princes had been entirely masters for several generations; and only supported a military corps of that nation. It seems probable, therefore, that these Danes only were put to death.'

The prophecy of Gunilda was exactly fulfilled. In 1003 Sueno and his Danes, who wanted only a pretence to renew their invasions, appeared off the western coast, and threatened vengeance for the slaughter of their countrymen. The English took measures for repulsing the enemy; but were defeated through the treachery first of Alfric, and then of Edric, a still greater traitor, who had married the king's daughter, and succeeded Alfric in the command of the British armies. The Danes, therefore, ravaged the whole country. Agriculture was neglected, a famine ensued, and the kingdom was reduced to the utmost degree of misery. At last the infamous expedient of buying a peace was again resorted to; and the departure of the Danes was purchased in 1007 at the expense of £30,000. The English endeavoured to employ this interval in making preparations against their return, which they had reason soon to expect. A law was made, ordering the proprietors of eight hides of land to provide themselves of a horseman and a complete suit of armour; and those of 310 hides to equip a ship for the defence of the kingdom. By this means a formidable armament was raised. There were 243,600 hides in England, and the ships equipped were therefore very numerous. The cavalry was 30,450 men. All hopes of success from this equipment, however, were disappointed by the factions, animosities, and dissensions of the nobles. Edric had caused his brother Brightric to advance an accusation of treason against Wolfnoth governor of Sussex, the father of the famous earl Godwin; who, knowing the power and malice of his enemy, deserted with twenty ships to the Danes. Brightric pursued him with a fleet of eighty sail; but his ships being shattered in a tempest, and stranded on the coast, he was suddenly attacked by Wolfnoth, and all his vessels were destroyed. The treachery of Edric frustrated every plan of future defence, and the whole navy was at last scattered. By these fatal miscarriages, the enemy had leisure to overrun the whole kingdom. They had now, indeed, obtained such a footing, that they could hardly have been expelled, even though the nation had been unanimous. But so far did dissension prevail, that the

governors of one province refused to march to the assistance of another; and were at last terrified from assembling their forces for the defence of their own. At last another peace was bought with £48,000; but this did not procure the usual temporary relief. The Danes, knowing that they were masters, took the money, and continued their devastations. They levied a further contribution of £8000 on the county of Kent alone; murdered the archbishop of Canterbury, who had refused to countenance this exaction, and made all the English nobility give hostages for their good behaviour. At last, Ethelred himself, dreading equally the violence of the enemy and the treachery of his own subjects, fled, in 1013, into Normandy, whither he had already sent his queen Emma, and her sons Alfred and Edward. The duke received his unfortunate guests with a generosity which does honor to his memory. The king had not been above six weeks abroad, however, when he heard of the death of Sueno, and received an invitation from the prelates and nobility to resume the kingdom. But his imprudence was incurable. His son-in law Edric, notwithstanding his repeated treasons, still retained such influence at court, that he instilled into the king jealousies of Sigefert and Morcar, two of the chief nobles of Mercia. Edric enticed them into his house, where he murdered them; while Ethelred partook of the infamy of this action, by confiscating their estates, and confining the widow of Sigefert in a convent. She was a woman of singular beauty and merit; and in a visit which was paid her, during her confinement, by prince Edmund the king's eldest son, she inspired him with so violent an affection, that he released her from the convent, and soon after married her without his father's consent.

In the mean time, Canute, the son and successor of Sueno, proved an enemy no less terrible to the English than his father had been. He ravaged the eastern coast with merciless fury; and put ashore all the English hostages at Sandwich, after having cut off their hands and noses. He was at last obliged to return to Denmark, but, in a short time, he returned, and continued his depredations along the south coast. He then broke into the counties of Dorset, Wilts, and Somerset; where an army was assembled against him under the command of prince Edmund and duke Edric. The latter still continued his perfidious machinations; and, after endeavouring in vain to get the prince into his power, dissipated the army, and then deserted to Canute with forty vessels. Edmund was not disheartened by this treachery. He again assembled his forces, and was in a condition to give the enemy battle. Ethelred, however, had now such frequent experience of the treachery of his subjects, that he had lost all confidence in them. He remained in London, affecting sickness, but, in reality, from an apprehension that they intended to buy their peace by delivering him up to his enemies. The army called aloud for their sovereign to march at their head against the Danes, and, on his refusal, they were so discouraged, that all the preparations which had been made became ineffectual, for the defence of the kingdom. Edmund, deprived of all regular resources for the maintenance of the soldiers, was obliged to commit similar ravages to those practised by the Danes; and after making so many fruitless expeditions into the north, which had submitted entirely to Canute's power, he returned to London, where he found every thing in confusion by the king's death.

Ethelred II. died in 1016, after an unhappy reign of thirty-five years; and was succeeded by his eldest son Edmund II., surnamed Ironside. He possessed abilities sufficient to have saved his country from ruin, had he come sooner to the throne: but it was now too late. He bravely opposed the Danes, however, notwithstanding every disadvantage; till, at last, the nobility of both nations obliged their kings to come to a compromise, and divide the kingdom between them by treaty. Canute reserved to himself Mercia, East Anglia, and Northumberland. The southern parts were left to Edmund. This prince survived the treaty only about a month, being murdered at Oxford by two of his chamberlains, accomplices of Edric. After the death of Edmund, nothing was left for the English but submission to Canute. The least scrupulous of mankind, however, dare not, at all times, openly commit injustice. Canute, therefore, before he seized the dominions of Edwin and Edward, the two sons of Edmund, suborned some of the nobility to depose, that, in the last treaty with Edmund, it had been agreed that, in case of Edmund's death, Canute should either be successor to his dominions, or tutor to his children. This evidence, supported by the great power of Canute, was sufficient to obtain his election as king of England. It is observable, says Dr. Lingard, that the ancient writers almost always speak of our kings as elected. Edwy's grandmother, in her charter (Lyc. App. IV.), says he, was chosen 'gecoren.' A remnant of this custom still obtains in our coronation ceremony, in which the people have the monarch proposed to their choice. Mr. Turner says, 'that the Norman conquest terminated the power of the Witenagemot, and changed the crown for an hereditary succession.' But this is to be doubted.

2. *Of England under the Danish princes.*—Immediately after Canute's accession to the throne, he sent the two sons of Edmund to the court of Sweden, on pretence of their being educated there; but charged that prince, it is said, to put them to death as soon as they arrived. The Swedish monarch did not comply with this request; but transferred them to the care of Stephen, king of Hungary. The elder Edwin was afterwards married to Stephen's sister; but, he dying without issue, that prince gave his sister-in-law, Agatha, daughter of the emperor Henry II., in marriage to Edward, the younger brother; and she bore him Edgar Atheling; Margaret, afterwards queen of Scotland; and Christina, who retired into a convent. Canute was obliged at first to make great concessions to the nobility, but he afterwards put to death many of those in whom he could not put confidence; and, among the rest, the traitor Edric, whom he cut down before his nobles with a battle axe, and his body was thrown into the Thames. Further to conciliate the people, he married Emma the widow of

Ethelred II., promising that he would leave the children he should have by that marriage heirs to the crown after his decease. The English were at first displeased with Emma for marrying the mortal enemy of her husband; but at the same time were glad to find at court a sovereign to whom they were accustomed, and who had already formed connexions with them: and thus Canute, besides securing by his marriage an alliance with Normandy, gradually acquired, by the same means, the confidence of his new subjects. The most remarkable transaction of his reign, besides those mentioned under the article CANUTE, is his expedition to Scotland against Malcolm II., whom he forced to do homage for the county of Cumberland, which the Scotch at that time possessed. After this Canute passed four years in peace, and died at Shaftsbury; leaving three sons, Sweno, Harold, and Canute.

The letter written by this prince to his subjects from Rome, as preserved by Spelman, is an interesting memorial of the age and of his own character:—

'Canute, king of all Denmark, England, and Norway, and of part of Sweden, to Egelnoth the metropolitan, to archbishop Alfric, to all the bishops and chiefs, and to all the nation of the English, both nobles and commoners, greeting. I write to inform you that I have lately been at Rome, to pray for the remission of my sins, and for the safety of my kingdoms, and of the nations that are subject to my sceptre. It is long since I bound myself by vow to make this pilgrimage; but I had been hitherto prevented by affairs of state, and other impediments. Now, however, I return humble thanks to the almighty God, that he has allowed me to visit the tombs of the blessed apostles Peter and Paul, and every holy place within and without the city of Rome, and to honor and venerate them in person. And this I have done, because I had learned from my teachers, that the apostle St. Peter received from the Lord the great power of binding and loosing, with the keys of the kingdom of heaven. On this account I thought it highly useful to solicit his patronage with God.

'Be it moreover known to you, that there was, at the festival of Easter, a great assemblage of noble personages with the lord the pope John, and the emperor Conrad, namely, all the chiefs of the nations from mount Gargano to the nearest sea, who all received me honorably, and made me valuable presents; but particularly the emperor, who gave me many gold and silver vases, with rich mantles and garments. I therefore took the opportunity to treat with the pope, the emperor, and the princes, on the grievances of my people, both English and Danes; that they might enjoy more equal law, and more secure safeguard in their way to Rome, nor be detained at so many barriers, nor harassed by unjust exactions. My demands were granted both by the emperor, and by the king Rodulf, to whom the greater part of the barriers belong: and it was enacted by all the princes, that my men, whether pilgrims or merchants, should, for the future, go to Rome and return in full security, without detention at the barriers, or the payment of unlawful tolls.

'I next complained to the pope, and expressed my displeasure that such immense sums were extorted from my archbishops, when, according to custom, they visited the apostolic see to obtain the pallium. A decree was made that this grievance should cease. Whatever I demanded, for the benefit of my people, either of the pope, or the emperor, or the princes, through whose dominions lies the road to Rome, was granted willingly, and confirmed by their oaths, in the presence of four archbishops, twenty bishops, and a multitude of dukes and nobles. Wherefore I return sincere thanks to God, that I have successfully performed whatever I had intended, and have fully satisfied all my wishes.

'Now, therefore, be it known unto you all, that I have dedicated my life to the service of God, to govern my kingdoms with equity, and to observe justice in all things. If, by the violence or negligence of youth, I have violated justice heretofore, it is my intention, by the help of God, to make full compensation. Therefore I beg and command those to whom I have confided the government, as they wish to preserve my friendship, or save their own souls, to do no injustice either to rich or poor. Let all persons, whether noble or ignoble, obtain their rights according to law, from which no deviation shall be allowed, either from fear of me, or through favor to the powerful, or for the purpose of supplying my treasury. I have no need of money raised by injustice.

'I am now on my road to Denmark, for the purpose of concluding peace with those nations who, had it been in their power, would have deprived us of both our crown and our life. But God has destroyed their means: and will, I trust, of his goodness preserve us, and humble all our enemies. When I shall have concluded peace with the neighbouring nations, and settled the concerns of my eastern dominions, it is my intention to return to England, as soon as the fine weather will permit me to sail. But I have sent you this letter beforehand, that all the people of my kingdom may rejoice at my prosperity. For you all know that I never spared nor will spare myself, or my labor, when my object is the advantage of my subjects.

'Lastly, I entreat all my bishops, and all the sheriffs, by the fidelity which they owe to me and to God, that the church-dues, according to the ancient laws, may be paid before my return; namely, the plough-alms, the tithes of cattle of the present year, the Peter-pence, the tithes of fruit in the middle of August, and the kirk-shot at the feast of St. Martin, to the parish church. Should this be omitted, at my return I will punish the offender by exacting the whole fine appointed by law. Fare ye well.'

Sueno, the son of Canute by his first marriage with Alfwena, daughter of the earl of Hampshire, was, on the death of that prince, crowned in Norway; Canute, whom Emma had borne, was in possession of Denmark; and Harold, who was full brother to Sueno, was at that time in England. This prince succeeded to the crown of England; though it had been stipulated that Emma's son Canute should be considered the heir. But the former, being on the spot, obtained

possession of his father's treasures, and all the resources of the government. As Canute, however, was supported by earl Godwin, a civil war was likely to ensue, when a compromise was made; by which it was agreed, that Harold should reign in London, and over all the provinces north of the Thames, while the possession of the south should remain to Canute. Till that prince should appear, and take possession of his dominions, Emma fixed her residence in Winchester, and ruled in the name of her son. Harold reigned four years, during which time, the only memorable action he performed was a most infamous piece of treachery.—Alfred and Edward, the two sons of Emma by Ethelred, paid a visit to their mother in England. But in the mean time, earl Godwin being gained over by Harold, a plan was laid for the destruction of these princes. Alfred was accordingly invited to London by Harold, with many professions of friendship; but when he had reached Guildford, about 600 of his train were murdered in the most cruel manner, he himself was taken prisoner, his eyes were put out, and he was conducted to the monastery of Ely, where he soon after died. Edward and Emma, apprised of the fate which awaited them, fled beyond sea, the former into Normandy, the latter into Flanders; while Harold took possession of all his brother's dominions without opposition.—He died in April 1039.

Canute II., surnamed the Hardy, and hence commonly called Hardicanute, succeeded his brother Harold without opposition. His government was extremely violent and tyrannical. It was, however, but of short duration. He died in 1041 of a debauch at the marriage of a Danish lord.

3. *Of England under the restored Saxon line.*—After the death of Hardicanute, a favorable opportunity was offered to the English, for shaking off the Danish yoke. Sueno, king of Norway, the eldest son of Canute, was absent; and, as the two last kings had died without issue, there appeared none of that race whom the Danes could support as successor to the throne. For this reason, the eyes of the nation were naturally drawn towards prince Edward, who happened to be at court when the king died. But it was feared that his succession would be opposed by earl Godwin, who was by far the most powerful nobleman in the kingdom. A declared animosity subsisted between the prince and Godwin, on account of the connexion of the latter with the murderers of his brother Alfred; and this, it was thought, he never would forgive. But common friends interposed, and, representing the necessity of a good understanding, obliged them to lay aside these animosities, and to concur in restoring liberty to their native country. Godwin only stipulated that Edward, as a pledge of his sincere reconciliation, should promise to marry his daughter Editha. This proposal was agreed to: Edward was crowned king of England, and married Editha, but the marriage proved a source of discord. Editha, though an amiable woman, could never obtain the confidence and affection of her husband. It is even said, that during the whole course of her life, he imposed upon himself a vow of continence; a species of behaviour highly celebrated by the monkish writers of the age, and which contributed, in no small degree, to his acquiring the titles of Saint and Confessor. Though the neglect of his daughter could not fail to awaken Godwin's former enmity, it was necessary to choose a more popular ground on which to vent his complaints. He therefore began to censure the influence which the Normans had in the public affairs, and a declared opposition took place between him and these favorites. In a short time this animosity broke out into great violence. Eustace, count of Bologne, having paid a visit to the king, passed by Dover on his return, where, one of his train being refused access to a lodging, he wounded the master of the house in the affray, and his townsmen revenged the insult by the death of the stranger. The count and his train now took arms, and slew the opponent of their countryman. A tumult ensued: near twenty persons were killed on each side; until Eustace, being overpowered with numbers, was obliged at last to fly. He complained to the king, who gave orders to earl Godwin, in whose government Dover lay, to punish the inhabitants. But this nobleman refused to obey the command, and endeavoured to throw the whole blame on Eustace and his followers. Edward was displeased, and threatened to make him feel his resentment, in case he finally refused to comply. Upon this, Godwin assembled a powerful army, in pretence of repressing some disorders on the frontiers of Wales, and marched directly towards the king's residence at Gloucester. Edward, perceiving his danger, for he was unattended by any considerable force, applied to Siward, duke of Northumberland, and Leofric, duke of Mercia, to hasten to him with their followers. Godwin, in the mean time, suffered himself to be deceived by negociations, till the king's army became so powerful, that he was not able to cope with it. He was therefore obliged to fly with his family to Flanders, where he was protected by earl Baldwin, together with his three sons, Gurth, Sueno, and Tosti; the last of whom had married Baldwin's daughter. Harold and Leofwin, two other sons of Godwin, took shelter in Ireland. After the flight of this turbulent noble, he was proceeded against as a traitor by king Edward. His estates, and those of his sons were confiscated; queen Editha was confined in a monastery; and the great power of this family, which had become formidable to the crown itself, seemed to be totally overthrown. Godwin, however, soon found means to retrieve his affairs. Having hired several ships, and manned them with his followers, he attempted to make a descent at Sandwich. The king, informed of his preparations, also equipped a fleet which Godwin could not resist; he therefore retreated into the Flemish harbours. On his departure, the English dismissed their armament. This Godwin had expected, and therefore kept himself in readiness for a favorable opportunity. He immediately put to sea, and, sailing to the Isle of Wight, was joined by Harold with a squadron which he had collected in Ireland. Being thus master of the sea, Godwin entered the harbours on the southern coast, seized all the English ships, and, being joined by great numbers of his former

vassals, sailed up the Thames, and appeared before London. The approach of such a formidable enemy threw the whole city into confusion. The king alone seemed resolved to defend himself to the last; but the interposition of many of the nobility, together with the submission of Godwin himself, at last produced an accommodation. It was stipulated that the earl should give hostages for his good behaviour, and that all foreigners should be banished the kingdom; after which Edward, sensible that he had no power to detain the hostages, sent them over to his kinsman the young duke of Normandy. Soon after this reconciliation, Godwin died as he was sitting at table with the king. He was succeeded in the government of Wessex, Sussex, Kent, and Essex, and in the office of steward of the household, a place of great power, by his son Harold, a man no less ambitious than his father; and, as he was of much greater abilities, he became a more dangerous enemy to Edward than even Godwin himself had been. The king knew no better expedient to prevent the increase of Harold's power, than by creating him a rival in the person of Algar, son of Leofric, duke of Mercia, whom he invested with the government of East Anglia. Harold, however, after some disputes, ultimately got the better of his rival, and banished him the kingdom. Algar, returning soon after with an army of Norwegians, invaded East Anglia; but his death in a short time freed Harold from all further apprehensions from that quarter. His power was still further increased soon after, by the accession of his brother, Tosti, to the government of Northumberland; and Edward, apprehensive that he would attempt to usurp the crown after his death, resolved to appoint a successor. He therefore sent a deputation into Hungary, to invite over his nephew, Edward, son to his elder brother, who was the only remaining heir of the Saxon line. That prince accordingly came over with his children, Edgar Atheling, Margaret, and Christina, but died a few days after his arrival. This event threw the king into greater perplexity than ever. Being resolved to exclude Harold, if possible, he had formerly designed to nominate his kinsman, William, duke of Normandy, as his successor; but finding that the English would more easily acquiesce in a sovereign of the Saxon line, he had sought his brother's descendants. The death of his nephew, however, at this time, and the inexperience of young Edgar, made him resume his former intentions in favor of the duke of Normandy, though his aversion to hazardous enterprises engaged him to postpone their execution. Harold, in the mean time, increased his popularity by all possible means. He had no suspicion of the duke of Normandy as a rival; but, as he knew that a son and grandson of earl Godwin were in the hands of that prince, he feared that they might be made use of as checks upon his ambition, in case he attempted afterwards to ascend the throne. He therefore prevailed upon Edward to consent to the release of these hostages; and having obtained his acquiescence, set out for Normandy, to bring them to England, attended by a numerous retinue. The motives of this journey of Harold's are, however, very obscure. The Norman writers say that he was sent on a message from Edward to the duke of Normandy, stating that he had nominated him his successor: others that he was merely making an occasional excursion along the channel, when driven over to the coast of France. Being driven, however, by a tempest on the dominions of Guy, count of Ponthieu, he was detained prisoner, and an exorbitant sum demanded for his ransom. Harold found means to acquaint William with his situation, when the duke of Normandy, desirous of gaining Harold over to his party, commanded Guy to restore him to his liberty. Upon this Harold was immediately delivered over to the Norman ambassador, and conducted to Rouen. William received him with great apparent friendship, but soon acquainted him with his pretensions to the English crown, and asked his assistance in the execution of his scheme. Harold was surprised, but, being in the duke's power, feigned a compliance with his desires, and promised to second to the utmost of his ability the will of king Edward. Still more to secure him to his interest, William promised him his daughter in marriage, and required him to confirm his promise of friendship by an oath. Harold readily complied; and, to make the oath more binding, William is said privately to have conveyed under the altar on which it was taken, reliques of some of the most revered martyrs; and when Harold had performed the ceremony he showed him the reliques, and admonished him to observe his solemn engagement. Harold, however, was no sooner at liberty, than he found himself master of casuistry sufficient to excuse the breaking of an oath, which had been extorted from him; and which, if kept, might be attended with the subjection of his country to a foreign power. He continued to practise every art to increase his own popularity; and availed himself with great adroitness of two occurrences at this time, which exhibited him to advantage. The Welsh had for some time made incursions into England, and had lately annoyed that kingdom so much, that Harold determined to undertake an expedition against the invaders. Having prepared some light armed foot to pursue them into their fortresses, cavalry to scour the open country, and a squadron of ships to attack them by sea, he reduced them to such distress, that they were obliged to purchase peace by sending the head of Griffin, their prince, to Harold, and submitting to the government of two Welsh noblemen appointed by Edward. The other incident was no less honorable to Harold. Tosti, his brother, had been created duke of Northumberland, but, being of a tyrannical disposition had treated the inhabitants with great cruelty and they rose in rebellion against him. Morcar and Edwin, two brothers, grandsons of the great duke Leofric, joined in the insurrection; and the former, being elected duke, advanced with an army to oppose Harold, who had been commissioned by the king to reduce and punish this faction. Before the armies engaged, Morcar endeavoured to justify his conduct, and represented to Harold, that Tosti had behaved in such a manner, that no one, not even a brother, could defend him without infamy: that the Northumbrians

were willing to submit to the king, but required a governor that would pay some attention to their privileges, and they trusted that Harold would not defend in another that violent conduct from which his own government had always been free. This speech, accompanied with a detail of well supported facts, induced Harold to abandon his brother's cause; and, returning to Edward, he persuaded him to pardon the Northumbrians, and confirm Morcar in his government. He even married the sister of that nobleman, and, by his interest, procured Edwin, the younger brother, to be made governor of Mercia. Tosti, in a rage, departed the kingdom, and took shelter in Flanders with Baldwin, his father-in-law; while William of Normandy saw that now he had nothing to expect from Harold, who plainly intended to secure the crown for himself.

Edward died in 1066, aged sixty-five, and was succeeded by Harold II., with as little opposition as if he had been the lawful heir. The very day after Edward's death, he was anointed and crowned by the archbishop of York. The whole nation seemed happy to swear allegiance to him. But he did not long enjoy that station, to obtain which he had taken so much pains, and for which he seemed to be well fitted. His brother, Tosti, provoked at his success, exerted against him every enemy whom he could influence. The duke of Normandy was also enraged to the last degree at his perfidy; but, before he commenced hostilities, sent an embassy to England, upbraiding Harold with his breach of faith, and summoning him to resign the kingdom. Harold replied, that the oath with which he was reproached had been extorted by the well-grounded fear of violence, and for that reason could never be regarded as obligatory: that he never had any commission, either from the late king or the states of England, who alone could dispose of the crown, to make any tender of the succession to the duke of Normandy; and if he, a private person, had assumed so much authority, and had even voluntarily sworn to support the duke's pretensions, the oath was unlawful, and it was his duty to take the first opportunity of breaking it: that he had obtained the crown by the unanimous suffrages of the people; and should show himself totally unworthy of their favor, did he not strenuously maintain those liberties with which they had entrusted him; and that the duke, if he made any attempt by force of arms, should experience the power of a united nation, conducted by a prince, who, sensible of the obligations imposed on him by his royal dignity, was determined that the same moment should put a period to his life and to his government. This answer was according to William's expectations; and he therefore had already made preparations for invading England. He was encouraged and assisted in this enterprise by Howel, count of Brittany, Baldwin, earl of Flanders, the emperor Henry IV. and pope Alexander II. The latter declared Harold a perjured usurper; denounced excommunication against him and his adherents; and sent William a consecrated banner, and a ring with one of St. Peter's hairs in it. He was ultimately enabled to assemble a fleet of 300 vessels, on board of which were embarked 60,000 men, and many distinguished personages. To embarrass the affairs of Harold more completely, William excited Tosti, in concert with Harfager, king of Norway, to infest the English coasts; and the confederates, having collected a fleet of 350 ships, sailed up the Humber, and committed great depredations in the neighbourhood. They were opposed by Morcar, earl of Northumberland, and Edwin, earl of Mercia, who were, however, defeated. But Harold having, on the news of this invasion, assembled a considerable army, engaged the enemy at Strandford, and, after a bloody battle, was declared victor. Tosti and Harfager were killed in the action, and their fleet fell into the hands of Harold, who generously allowed Olaus, the son of Harfager, to depart with twenty vessels. He had scarcely accomplished his victory, when news were brought that the Normans were landed in Sussex. Harold's expedition had at this time considerably weakened his army. The action itself had cost him his bravest men; and he disgusted the rest by refusing to distribute the spoils among them He hastened, however, by rapid marches, to repel the new invader; but, though he was reinforced from London and other places with fresh troops, his friends were dispirited. Gurth, his brother, a man of great prudence and bravery, became apprehensive of the event; and entreated the king to avoid, for a time, a general engagement; or at least not to hazard it in person. But Harold was deaf to every thing like delay or compromise. Accordingly on the 13th October, 1066, the two armies met near Hastings, in Sussex, and prepared to decide, in the memorable battle of that name, who was to be master of England.

The night before the battle was passed very differently in the two camps. The English are said to have spent it in riot and disorder; the Normans in prayer. When, in the morning, both armies prepared for battle, William divided his into three lines; the first, headed by Montgomery, consisting of archers and light armed infantry; the second, commanded by Martel, of his bravest heavy battalions, ranged in close order; his cavalry, at whose head he placed himself, formed the third line, and were so disposed that they stretched beyond the infantry, and flanked each wing. Having given the signal of battle, the whole of his forces moved forward at once, and singing the famous song of Roland, a peer of Charlemagne's, advanced with alacrity upon the enemy. Harold had taken advantage of a rising ground, and, having constructed trenches to secure his flanks, resolved to stand upon the defensive, and to avoid all action with the Norman cavalry, his own being inferior. The Kentish men were placed in the van; the Londoners guarded the standard; and the king, accompanied by his valiant brothers, Gurth and Leofwin, dismounting from horseback, placed himself at the head of his infantry, and expressed a resolution to conquer or perish. The first attack of the Normans was desperate, but was received with great valor by the English: and after a furious conflict, which remained long undecided, the former, overcome by the difficulty of the ground and hard pressed by the enemy, began to give

way. Confusion was rapidly spreading among his troops, when William hastened, with a select band, to their relief, and restored their courage. The English then began to waver; and, the duke ordering his second line to advance, renewed the attack with fresh forces. Finding that the enemy, aided by the advantage of ground, and animated by the example of their prince, still made a formidable resistance, he suddenly commanded his forces to retreat. The artifice succeeded; the inexperienced troops of Harold were allured from their vantage ground, and, heated by the action, precipitated themselves into the plain. William now ordered the infantry to face about, and the cavalry to advance at the same instant upon their pursuers. The English were at once repulsed and driven back to the hill with great slaughter; where, however, being rallied again by the brave Harold, notwithstanding their loss, they maintained their post, and continued the combat. The duke tried the same stratagem a second time, with the same success; but, even after this doubtful advantage, he found a great body of the English, who, in firm array, seemed determined to dispute the victory with him. He therefore ordered his heavy-armed infantry to advance, while his archers, placed behind, galled the enemy, who were exposed by the situation of the ground. By this arrangement he at last prevailed. Harold was slain by an arrow, while fighting with great bravery at the head of his men. His brothers shared the same fate; and the English, discouraged by their fall, gave ground on all sides, and were pursued with great slaughter by the Normans. Thus was gained this decisive and hard-fought battle, which lasted from morning till sunset. William had three horses killed under him; and it is said to have cost him nearly 15,000 Normans. The loss was still more considerable on the English side. On the dead body of Harold being brought to the victor, he restored it, without ransom, to his mother.

We cannot better introduce, than in this place, those *Supplementary Observations* on the Anglo-Saxon period of our history, which the researches of modern writers (particularly Mr. Turner and Dr. Lingard), enable us to make.

Throughout the Anglo-Saxon period, Dr. Lingard has enjoyed the advantage of Mr. Turner's previous labors. Milton, it will be remembered, describes the various struggles for power during this portion of our history, as not more worthy a distinct narrative than the conflicts of kites and crows; and it was long the habit of our historians to neglect it accordingly. Hume disposes of the six centuries of important events which it involves—its connexion with the foundations of our monarchy, the history of parliament, the genius of our laws and language, the trial by jury, &c., in one-third of his first volume. But to Mr. Turner and Dr. Lingard are we indebted for what may now be regarded as a complete illustration of its claims. Of no portion of our annals may the student of English history obtain a more accurate knowledge in his mother tongue; and the valuable information these gentlemen unite to furnish, is a lasting memorial of the importance of exploring the most thorny paths of history. This period occupies nearly the whole of the first volume of Dr. Lingard's work, in 4to.

The writer here exhibits the ancient union of an elective with an hereditary character in our monarchy. The cyning, or king, was the noblest of the ethel, or noble-born. Before the light of Christianity had penetrated their superstitions in each of the Saxon dynasties, he could trace his origin to Woden. A religious veneration thus surrounded his person and family, which it became one of the first efforts of the Christian priesthood to continue, in coronation ceremonies and episcopal consecration. But the witan, or witenagemot, regularly elected the prince before he could be crowned. Looking with whatever feelings of regard and hope on the family of their former chiefs, they decreted upon the particular branch of it most eligible for the vacant throne. Hence we find, in the same coronation ceremonies, an elective rite of 'recognition,' as it has been called in modern times. The contemporary biographer of Dunstan (apud Boll. tom. iv. Maii 344), says 'ab universis Anglorum principibus communi *electione*.' He also intimates that Wessex and Mercia had not yet coalesced into one kingdom: 'ut in utraque plebe regum numeros nominaque suppleret *electus*.'

The witenagemot, the embryo of our modern parliament, was an assembly of the great 'and wise men,' both of church and state. The Anglo-Saxon kings call them 'meorum sapientium archontum, conciliatorum meorum, my witan,' &c. Their functions were both legislative and judicial. But Dr. Lingard can find nothing *representative* in the character of any of its members. They were principally the spiritual and temporal thanes who held lands immediately of the crown, and who could command the services of those military vassals, without whose assistance the laws of that period could not have been executed. The signatures of many of their acts and decisions, which have come down to us, do not exceed thirty in number, according to this writer, and never amount to sixty. They usually consist of the names of the king and his sons, and sometimes that of the queen; those of a few bishops and abbots, one or two abbesses, and about the same number of temporal and spiritual lords. There exists no proof that the accompanying vassals were admitted to any share in their deliberations, although they are frequently 'mentioned as looking on and applauding.'

Dr. Lingard disputes the representation of Mr. Hume and others, who regard the Norman Conquest as introducing the feudal system into this country. He traces the germs of that system in the earliest periods of the Anglo-Saxon government; and contends that they flourished in full luxuriance long before its termination. At the conquest, its various obligations and services only changed their names. In illustration of the strong tie by which the Saxon vassal held himself bound to his lord (the root of all the other feudal obligations), our author adverts to the memorable story of the murder of Cynewulf, king of Wessex. This story will also illustrate another feature in the Anglo-Saxon character—the fero-

city of their revenge. Thirty-one years after the death of Sigebyrcht, the predecessor of Cynewulf, Cyneheard, his brother, returned to the neighbourhood of Winchester to avenge his death. He was accompanied by eighty-four adherents.

'It chanced one evening that the king left Winchester with a slender retinue, to visit a lady at Merton, to whom he was warmly attached. Cyneheard stole silently from his retreat, followed with caution the footsteps of the monarch: and in the dead of the night surrounded the residence of his mistress. Cynewulf was asleep: his attendants were dispersed in the neighbouring houses. At the first alarm he arose, seized his sword, and descended to the door, where he descried his enemy; and, springing forward, aimed a desperate blow at the head of Cyneheard. The wound, which was but slight, was quickly revenged by the weapons of the conspirators. Roused by the noise of the combatants, and the shrieks of the women, the king's attendants hastened to his assistance: but they found him breathless, and weltering in his blood. It was in vain that Cyneheard offered them their lives and possessions. They scorned his proposals: and, after a long conflict, were all slain, with the exception of a Briton, who, in quality of hostage, had been detained in the court of Cynewulf; even he was severely wounded.

'Early in the morning the news arrived at Winchester. The earldoman Osric, and Wiverth the thane, immediately mounted their horses, and rode to Merton, followed by their retainers. Cyneheard met them at the gate to justify his conduct, and solicit their friendship. He pleaded the obligation of revenging the wrongs of his family: asserted his claim to the throne: offered them valuable possessions, and bade them recollect that many of his friends were their kinsmen. 'Our kinsmen,' they replied, 'are not dearer to us than was our lord. To his murderers we will never submit. If those who are related to us wish to save their lives, they are at liberty to depart.' 'The same offer,' returned the followers of Cyneheard, 'was made to the king's attendants. They refused it: we will prove to day that our generosity is not inferior to theirs.' Impatient of delay, Osric forced the barrier: he was opposed with the most desperate intrepidity; and the battle was terminated only by the failure of the combatants. Of Cyneheard's eighty-four companions one alone was saved. He was found among the slain, covered with wounds, but still alive; and owed his preservation to this fortunate circumstance, that he was the godson of Osric.'

We have noticed Dr. Lingard's efforts to rescue the memory of the celebrated Dunstan from obloquy. Mr. Turner confirms our protestant antipathy to the character of this intriguing and ambitious ecclesiastic. He shows him to have been a principal artificer in that system of pious frauds, by which the church obtained so lucrative an ascendancy over our Anglo-Saxon princes; and respecting which, it is his only excuse that his education would render him in part the dupe and the victim of them. He seems to have been born for better things; and was certainly better employed in painting 'a robe for a lady, which she afterwards embroidered,' than in following his sovereign into the privacy of domestic life and dragging him back to an Anglo-Saxon banquet—although it was a coronation feast. But this outrage, and the subsequent cruelties said to be committed by Dunstan, partly on Elgiva, or Ethelgiva, Dr. Lingard, we have seen, in substance denies; and attributes almost incredible vice to the character of the young prince, to relieve that of the monk.

The copious 'Appendix I.' on the polity, feudal customs, ranks, laws, &c. of the Anglo-Saxons, is a very valuable portion of Dr. Lingard's work. We have adverted to some of his remarks on the prevalence of the feudal system amongst them. In their administration of justice he discovers the origin of most of our present courts of law. The 'sac and soc' was the lowest species of jurisdiction, perpetuated in the manorial courts of the Normans, and in our present courts leet and courts baron. The hundred motes assembling every month, under the presidency of the ealdorman or reeve, decided the more weighty affairs of the hundred, and was a public meeting for transacting and confirming important private business. Once a year an extraordinary meeting of the hundred mote was held, at which every male above twelve years of age was required to be present; and, on some occasions, the ealdorman called to his assistance the wise men of the neighbouring hundred, or the third part of the county—the 'tything.' The shire mote was of still higher dignity, and was held twice a year, in spring and autumn. All great proprietors of land were summoned, and the bishop and ealdorman, or earl, presided with equal authority. Here the laws of the witenagemot were recited; a definite judgment pronounced in all ordinary suits; and vows of obedience renewed to the king. The witenagemot, under the presidency of the monarch, had an unlimited control over the whole system. We should gladly extract this writer's entertaining account of the criminal proceedings of these courts, and particularly of the trials by ordeal, but our limits only permit a reference to them. The Anglo-Saxon crimes were those of every semi-barbarous people, drunkenness, theft, and homicide; the love of vengeance, and the perpetuation of family feuds. Their excellencies—personal courage, and a devoted attachment to their chiefs, and their own political institutions.

In fine, on the comparative merits of Mr. Hume and Dr. Lingard, as historians, let the reader compare the account given by the former of the introduction of Christianity (it is a delicate subject for both writers) into the kingdoms of the Anglo-Saxon octarchy, with the following simple and animated passage of Dr. Lingard's work.

'At the death of Cealwin, Ethelbert had acquired (by what means we are not informed) the dignity of Bretwalda, and his authority was admitted by all the Saxon princes south of the Humber. While in possession of this dignity, he received intelligence that forty strangers had landed on the Isle of Thanet. These were Augustine and his associates, partly Gauls, partly Italians, whom pope Gregory the Great

had sent for the benevolent purpose of converting tne pagans. Ethelbert could not be unacquainted with the Christian religion. It was probably the religion of the majority of the British slaves in his dominions: it was certainly professed by his queen, Bertha, the daughter of Charibert, king of Paris. The Saxon prince received the missionaries under an oak, in an open field, at the suggestion of his priests, who told him that in such a situation the spells of the foreign magicians would lose their influence. At the appointed time Augustine was introduced to the king. Before him were borne a silver cross, and a banner representing the Redeemer; behind him his companions walked in procession, and the air resounded with the anthems which they sung in alternate choirs. As soon as the interpreter had explained the object and motives of their mission, Ethelbert replied that he had no wish to abandon the gods of his fathers for a new and uncertain worship: but that as the intention of the strangers was benevolent, and their promises were inviting, they might preach without molestation, and should be supported at his expense. This favorable answer filled them with joy; and they proceeded to Canterbury, chanting as they went, the following prayer:—'By thy great mercy, O Lord, turn away, we beseech thee, thy anger from this thy city and thy holy temple, for we are sinners—hallelujah.' On the feast of Pentecost, in the year 597, Ethelbert professed himself a Christian, and received the sacrament of baptism; and, on the following Christmas, 10,000 of his subjects followed the example of their sovereign.' Vol. 1. pp. 80—2.

The corresponding passage in Hume is introduced in his best manner, offering a fair picture of the pagan superstitions and political prejudices, which were subdued in this peaceful extension of the faith. The reflections of Gregory on the sight of some British youths exposed as slaves at Rome, and the professions of Ethelbert above alluded to, are admirably wrought into the narrative; but ought our readers to forget, that one-half of it is defiled by extracts from the correspondence of Gregory and Augustine, which no considerate parent would suffer to be read in his family; and that for the satisfaction of our young gentlemen who consult this historian for a knowledge of these events still more objectionable matter is appended in a long Latin note.

The conversion of Northumbria followed that of Kent, through the marriage of the daughter of Ethelbert to Edwin. Mr. Hume admits the ability and prudence of this prince, his hesitation about receiving the Christian doctrine, and his severe and long examination of its evidences. But the narrative of Bede, after which he here writes, (see his margin), contains the following beautiful episode on the claims of the Christian religion.

'Having taken his resolution, Edwin called an assembly of his witan, or counsellors, and required each to state his sentiments on the subject. The first who ventured to speak was Coiffi, the high priest, who, instead of opposing, advised the adoption of the foreign worship. His motive was singular. No one, he said, had served the gods more assiduously than himself, and yet few had been less fortunate. He was weary of deities who were so indifferent or so ungrateful, and would willingly try his fortune under the new religion. To this profound theologian succeeded a thane, whose discourse, while it proves the good sense of the speaker, exhibits a striking picture of national manners. He sought for information respecting the origin and destiny of man. 'Often,' said he, 'O king, in the depth of winter, while you are feasting with your thanes, and the fire is blazing on the hearth in the midst of the hall, you have seen a bird pelted by the storm, enter at one door and escape at the other. During its passage it was visible; but whence it came, or whither it went, you knew not. Such, to me, appears the life of man. He walks the earth for a few years; but what precedes his birth, or what is to follow after his death, we cannot tell. Undoubtedly, if the new religion can unfold these important secrets, it must be worthy our attention.'

'Paulinus, the missionary, now explained the principal doctrines of Christianity, and Coiffi declaring himself a convert, headed a party to set fire to the neighbouring pagan temple of Godmundham.' All this our popular historian dismisses by noticing only the conduct of the priest Coiffi.

We are surprised, however, that this intelligent writer affords us no summary of the state of the arts, and such sciences as were cultivated among the Anglo-Saxons. Can he have forgotten their love of music? Their cathedral chanting? Their illuminated missals, and other MSS.? Or their architecture? On these interesting topics we have only room for a few extracts from the important work of Mr. Turner.

Of their *music* and ecclesiastical *chanting*, the historian of the Anglo-Saxons, says, they 'had the instruments of chords, and wind-instruments. In the drawings on their MSS. we see the horn, trumpet, flute, and harp, and a kind of lyre of four strings, struck by a plectrum. In one MS. we see a musician striking a four-stringed lyre, while another is accompanying him with two flutes, into which he is blowing at the same time. In the MSS. which exhibit David and three musicians playing together, David has a harp of eleven strings, which he holds with his left hand while he plays with his right fingers; another is playing on a violin or guitar of four strings with a bow; another blows a short trumpet, supported in the middle by a pole, while another blows a curved horn. This is probably the representation of an Anglo-Saxon concert.

'The chord instrument like a violin was perhaps that to which a disciple of Bede alludes, when he expresses how delighted he should be to have 'a player who could play on the cithara, which we call rotæ.' Of the harp, Bede mentions, that in all festive companies it was handed round, that every one might sing in turn. It must have therefore been in very common use.

'Dunstan is also described by his biographer to have carried with him to a house his cythara, 'which, in our language, we call hearpan.' He hung it against the wall, and one of the strings happening to sound untouched, it was esteemed a miracle.

'The organ was in use among the Anglo-Sax-

ons. Cassiodorus and Fortunatus mention the word organ as a musical instrument, but it has been thought to have been a collection of tubes blowed into by the human breath. Muratori has contended that the art of making organs like ours was known in the eighth century only to the Greeks; that the first organ in Europe was the one sent to Pepin from Greece in 756; and that it was in 826 that a Venetian priest, who had discovered the secret, brought it into France. A passage which I have observed in Aldhelm's poem, De Laude Virginum, entirely overthrows these theories; for he, who died in 709, and who never went to Greece, describes them in a manner which shows that he was acquainted with great organs made on the same principle as our own:

> Maxima millenis auscultans organa flabris
> Mulceat auditum ventosis follibus iste
> Quamlibet auratis fulgescant cætera capsis.

This is literally, 'Listening to the greatest organs with a thousand blasts, the ear is soothed by the windy bellows, while the rest shines in the gilt chests.' Dunstan, great in all the knowledge of his day, as well as in his ambition, is described to have made an organ of brass pipes, elaborated by musical measures, and filled with air from the bellows. The bells he made have been mentioned before. About the same time we have the description of an organ made in the church at Ramsey. 'The earl devoted thirty pounds to make the copper pipes of organs, which, resting with their openings in thick order on the spiral winding in the inside, and being struck, on feast days, with the strong blast of bellows, emit a sweet melody, and a far-resounding peal.'

'In 669 Theodore and Adrian, who planted learning among the Anglo-Saxons, also introduced into Kent the ecclesiastical chanting, which Gregory the Great had much improved. From Kent it was carried into the other English churches. In 678 one John came also from Rome, and taught in his monastery the Roman mode of singing, and was directed, by the pope, to diffuse it amongst the rest of the clergy, and left written directions to perpetuate it. Under his auspices it became a popular study in the Saxon monasteries. We have a pleasing proof of the impressive effect of the sacred music of the monks, in the little poem which Canute the Great made upon it. As the monarch, with his queen and courtiers, were approaching Ely, the monks were at their devotions. The king, attracted by the melody, ordered his rowers to approach it, and to move gently while he listened to the sounds which came floating through the air from the church on the high rock before him. He was so delighted by the effect, that he made a poem on the occasion, of which the first stanza only has come down to us. There are many ancient MSS. of the Anglo-Saxon times, which contain musical notes.'

He thus describes, after Muratori, what is known of their mode of *illuminating* books:—'The Anglo-Saxons were fond of beautifying their MSS. with drawings with ink of various colors, colored parchment, and sometimes with gilt letters. The Gospels, Nero, D. 4., exhibit a splendid instance of these ornaments. The Franco-theotisc Gospels, Calig. A. 7., are also highly decorated. Many Saxon MSS. in the Cotton Library exhibit very expensive, and what in those days were thought beautiful, illuminations. The art of doing these ornaments has been long in disuse; but some of the recipes for the materials have been preserved. They prepared their parchment by this rule: 'Put it under lime, and let it lie for three days, then stretch it, scrape it well on both sides, and dry it, and then stain it with the colors you wish.' To gild their skins we have these directions:—'Take the red skin and carefully pumice it, and temper it in tepid water, and pour the water on it till it runs off limpid. Stretch it afterwards, and smooth it diligently with clean wood. When it is dry, take the whites of eggs, and smear it therewith thoroughly; when it is dry, sponge it with water, press it, dry it again and polish it; then rub it with a clean skin, and polish it again, and gild it.'

'Their methods for preparing gold for their gold writing may be mentioned, as they were in fact so many chemical experiments. One method:—'File gold very finely, put it in a mortar, and add the sharpest vinegar; rub it till it becomes black, and then pour it out. Put to it some salt or nitre, and so it will dissolve. So you may write with it, and thus all the metals may be dissolved.'

'The gold letters of the Anglo-Saxon MSS. are on a white embossment, which is probably a calcareous preparation. Modern gilding is made on an oil size of yellow ochre, or on a water size of gypsum, or white oxide of lead, or on similar substances. For gilding on paper or parchment, gold powder is now used as much as leaf gold. Our ancestors used both occasionally. Another method of ancient chrysography:—'Melt some lead, and frequently immerge it in cold water. Melt gold, and pour that into the same water, and it will become brittle. Then rub the gold filings carefully with quicksilver, and purge it carefully while it is liquid. Before you write, dip the pen in liquid alum, which is best purified by salt and vinegar.' Another method:—'Take thin plates of gold and silver, rub them in a mortar with Greek salt or nitre till it disappears. Pour on water, and repeat it. Then add salt, and so wash it. When the gold remains even, add a moderate portion of the flowers of copper and bullock's gall; rub them together, and write and burnish the letters.' Other methods are mentioned, by which even marble and glass might be gilt. These descriptions are taken by Muratori from a MS. of the ninth century, which contains many other curious receipts on this subject.'

Of their *architecture* Mr. Turner observes, 'The arts of life are found to flourish in proportion as their productions are valued and required. When the Anglo-Saxons became converted to Christianity, they wanted monasteries and churches. And this demand for architectural ability would have produced great perfection in the art, if the state of the other arts and sciences had permitted a due cultivation of genius in this; but no single art can attain perfection if

every other be neglected, or if general ignorance enfeeble and darken the mind. Patronage therefore, though it called forth whatever mechanical labor and barbarian taste could fabricate, could not miraculously create taste and regular science. The love of sublimity is more congenial to the rude heroism of infant civilisation, and therefore our ancient architecture often reached to the sublime; but while we admire its vastness, its solidity, and its magnificence, we smile at its irregularities, its discordancies, and its caprice.

'The chief peculiarities of the Anglo-Saxon architecture, of which several specimens, though in fragments, exist, are declared to be a want of uniformity of parts, massy columns, semicircular arches, and diagonal mouldings. Of these the two first are common to all the barbarous architecture of Europe. But the semicircular arches and diagonal mouldings seem to have been more peculiar additions to the Saxon building. That the round arches were borrowed from Roman buildings, is the prevailing sentiment. It is at least a fact, that the Saxons must have seen them among the numerous specimens of the imperial architecture which they found in England.

The universal diagonal ornament, or zig-zag moulding, which is a very distinguishing trait of the Saxon architecture, is found disposed in two ways; one with its point projecting outwards, and the other with its point lying so as to follow the lines which circumscribe it, either horizontal, perpendicular, or circular. On this singular ornament an etymological remark may be hazarded, as it may tend to elucidate its origin. The Saxon word used to denote the adorning of a building is gefrætwian, or frætwan; and an ornament is frætew; but frætan signifies to gnaw or to eat; and upon our recollecting that the diagonal ornament of Saxon building is an exact imitation of teeth, we can hardly refrain from supposing that the ornament was an intended imitation of teeth. Frætwin and frætwung, which they used to signify ornament, may be construed fretwork, or teeth-work. The teeth which the Saxon diagonals represent, are, I believe, marine teeth. If so, perhaps they arose from the stinging of teeth of the large sea animals. We will mention a few of the ancient Saxon buildings we meet with, and show how they are described.

'In 627 Paulinus built the first Christian church, in Northumbria, of wood; it was afterwards rebuilt on a larger scale, and with stone: he also built a stone church at Lincoln. His church at York was not very skilfully erected: for in less than a century afterwards, Wilfrid found its stony offices half destroyed; its roof was permeable to moisture. It had windows of fine linen cloth, or latticed wood-work; but no glazed casements, and therefore the birds flew in and out, and made nests in it. So Bede says of his church at Lincoln, that though the walls were standing, the roof had fallen down.

'In 676 Benedict sought cementarios or masons, to make a church in the Roman manner, which he loved. But the Roman manner seems not to express the Roman science and taste, but rather a work of stone of the large size which the Romans used. It was finished in a year after its foundation. At this period glass-makers were not known among the Saxons. But Benedict had heard of them, and he sent to Gaul for some, to make latticed windows to the porticoes and cænaculum of the church. From those whom he employed the Saxons learned the art.

'In the seventh century Cuthbert built a monastery, which is described. From wall to wall it was of four or five perches. The outside was higher than a standing man. The wall was not made of cut stone, or bricks and cement, but of unpolished stones and turf, which they had dug from the spot. Some of the stones four men could hardly lift. The roofs were made ot wood and clay.

'About 709 Wilfred flourished. He, like many others, had travelled to Rome, and, of course, beheld the most valuable specimens of ancient art. He brought thence some masons and artificers. Though he could not imitate these, he sought to improve the efforts of his countrymen. The church of Paulinus at York he completely repaired. He covered the roof with pure lead, he washed its walls from their dirt, and by glass windows (to use the words of my author), he kept off the birds and rain, and yet admitted light. At Rapon he also erected a church with polished stone, adorned with various columns and porticoes. At Hexham he made a similar building. It was founded deep, and made of polished stones, with many columns and porticoes, adorned with great length and height of walls. It had many windings, both above and below, carried spirally round. It was superior to any edifice on this side of the Alps. In the inside was a stony pavement, on which a workman fell from a scaffold of enormous height.

'In 716 we read of Croyland monastery. The marshy ground would not sustain a stony mass. The king, therefore, had a vast number of piles of oak and alders fixed in the ground, and earth was brought in boats nine miles off to be mingled with the timber and the marsh, to complete the foundation.

'In 969 a church was built. The preceding winter was employed in preparing the iron and wooden instruments, and all other necessaries. The most skilful artificers were then brought. The length and breadth of the church were measured out; deep foundations were laid on account of the neighbouring moisture, and they were strengthened by frequent percussions of the rams. While some workmen carried stones, others made cement, and others raised both aloft by a machine with a wheel. Two towers with their tops soon rose, of which the smaller was visible on the west in front of the church. The larger in the middle with four spires, pressed on four columns, connected together by arches passing from one to the other, that they might not separate. It is supposed that many specimens of ancient Saxon architecture yet remain; as part of St. Peter's at Oxford, part of St. Alban's abbey church, Tickencote church, near Stamford in Lincolnshire, the porch on the south side of Shireburn minster, Barfreston church in Kent, Iffley church, and some others. But the works and delineations of professional men must be consulted on this subject.'

1. *Of England, from the period of the Norman conquest, until the accession of Henry II.*— Nothing could exceed the terror of the English upon the news of the defeat and death of Harold. As soon as William passed the Thames at Wallingford, Stigand, the primate, made submissions to him in the name of the clergy; and before he came within sight of London, all the chief nobility, including Edgar Atheling himself, came and submitted to the conqueror. William readily accepted of the crown upon the terms offered him; viz. that he should govern according to the established customs of the country. He could indeed have made what terms he pleased; but, though in reality a conqueror, he chose rather to be thought an elected king. For this reason he was crowned at Westminster, by the archbishop of York, and took the usual oath, that he would protect and defend the church, observe the laws of the realm, and govern the kingdom with impartiality. The English historians complain of the most grievous oppression by William and his Normans. Whether the conqueror willingly gave the English opportunities of rebelling against him, in order to have a pretence for oppressing them afterwards, is uncertain; but the beginning of his reign cannot justly be blamed. The first disgust against his government was excited among the clergy. William could not avoid rewarding those numerous adventurers who had accompanied him in his expedition. He first divided the lands of the English barons who had opposed him, among his Norman barons: but as these were insufficient, he quartered the rest on the rich abbeys, until some other opportunity of providing for them should offer. This last step was highly resented by the clergy. The whole nation was soon after disgusted, by seeing all the real power of the kingdom placed in the hands of the Normans. The king disarmed the city of London, and other places which appeared most warlike and populous, and quartered Norman soldiers wherever he dreaded an insurrection. Having thus secured England, as he imagined, from any danger of a revolt, he determined to pay a visit to his Norman dominions. His brother Odo, bishop of Bayeux, and William Fitz-Osborne, were appointed regents in his absence; and to secure himself yet farther, he resolved to carry along with him those of the English nobility in whom he had least confidence. William set sail for Normandy in March, 1067; but his absence produced the most fatal consequences. Discontents and murmurings were every where multiplied; secret conspiracies were entered into; hostilities were commenced in many places; and every thing seemed to threaten a speedy revolution. William of Poictiers, a Norman historian, throws the blame entirely on the English. He calls them a fickle and mutinous race, while he celebrates with the highest encomiums the justice and lenity of Odo's and Fitz-Osborne's administration. On the other hand, the English historians tell us, that the regents took all opportunities of oppressing the people, with a view to provoke them to rebellion, and to enrich themselves on their submission. Be this as it may, a secret conspiracy was formed among the English for a general massacre of the Normans, and the vassals of the earl of Coxo actually put him to death because he refused to head them in the enterprise. The conspirators had already taken their final resolution, and fixed on Ash Wednesday, during the time of divine service, for the intended massacre. But the sudden return of William disconcerted all their schemes. Having received intelligence of their bloody purpose, he hastened to England. Such of the conspirators as had been more open in the scheme fled, and this confirmed the accusation against those who remained. William from this period not only lost all confidence in his English subjects, but regarded them as irreconcileable enemies. He raised a vast number of fortresses in the country, until he no longer dreaded the tumultuous efforts of the multitude; and determined to treat the whole as a conquered nation. One of his most decided steps of this kind was the revival of the tax of Dan-gelt, which produced great discontents. The inhabitants of Exeter and Cornwall revolted; but were soon reduced. A more dangerous rebellion broke out in the north; but this was also quashed, and the English became sensible that farther resistance was vain. Their easy submission after the battle of Hastings had inspired the Normans with contempt; their commotions afterwards had rendered them objects of hatred; and they were now deprived of every means which could make them either feared or beloved. Many fled into foreign countries; and among the rest Edgar Atheling, who made his escape to Scotland, with his two sisters, Margaret and Christina. They were well received by Malcolm III., who soon after married Margaret, and received a great number of other exiles with kindness. The people at large, though unable to make any open resistance, did not fail to gratify their resentment against the Normans privately. Seldom a day passed, but the bodies of their assassinated conquerors were found in the woods and high-ways, without any possibility of bringing the authors of their death to justice. This made the Normans themselves begin to wish for tranquillity and security: and several of those entrusted with great commands, desired to be dismissed from the service of the crown. William was obliged to allure many to his service by the largeness of his bounties. The consequences were, fresh exactions from the English, and new insurrections on their part against their masters. The Norman power, however, was too well founded to be finally shaken, and every attempt of the English to regain their liberty served only to rivet their chains. The county of Northumberland, which had been most active in these insurrections, now suffered most severely. The whole of it was laid waste, the houses were burned, the instruments of agriculture destroyed, and the inhabitants dispersed. On this occasion it is said that above 100,000 persons perished either by the sword or famine. The estates of the English gentry were next confiscated, and bestowed on the Normans. Thus most of the ancient and honorable families were reduced to ruin, and the English found themselves totally excluded from honors and preferments. William thus at last broke their spirit and received no

farther trouble from them. He found himself, however, throughout the latter part of his life unhappy through the dissensions of his own family. Robert, his eldest son, surnamed Curthose, from the shortness of his legs, was a prince who inherited all his own bravery and ambition. He had formerly been promised by his father the government of the province of Maine in France, and was declared successor to the dukedom of Normandy. He demanded the fulfilment of several of these promises; but William gave him a flat denial, observing, that 'it was not his custom to throw off his clothes till he went to bed.' Robert declared his resentment; and openly expressed his jealousy of his brothers William and Henry. An open rupture soon occurred. The two young princes, one day, sportively threw water upon him as he passed through the court; and Robert inflamed by one of his favorites construed this frolic into a studied indignity. He drew his sword, and ran up stairs with an intent to take revenge. The whole castle was quickly in a tumult; and it was not without difficulty that the king himself could appease it. He could not, however, allay the animosity which from that moment prevailed in his family. Robert, attended by several of his confederates, withdrew to Rouen that night, hoping to surprise the castle; but his design was defeated by the governor. The popularity of the prince, however, engaged all the young nobility of Normandy, as well as of Anjou and Brittany, to espouse his quarrel; even his mother is supposed to have supported him in his rebellion by secret remittances. The contest continued for several years; and William was at last obliged to have recourse to England for support against his own son. Accordingly he led an army of Englishmen over to Normandy, where he soon compelled Robert and his adherents to quit the field, and was reinstated in his dominions. Robert then took shelter in the castle of Gerberoy, which the king of France had provided for him, and where he was shortly after besieged by his father. As the garrison was strong, they made a gallant defence, and many skirmishes and duels were fought under its walls. In one of these the king and his son happened to meet; but being both concealed by their helmets, they attacked each other with fury. The young prince wounded his father in the arm, and threw him from his horse. The next blow would probably have put an end to his life had he not called for assistance. Robert instantly recognised his father's voice, leaped from his horse and raised him from the ground. He then prostrated himself, it is said, asked pardon for his offences, and promised for the future a strict adherence to filial duty. The king was not so easily appeased; and no doubt his resentment was heightened by the disgrace of being overcome. He therefore gave his malediction to his son; and returned to his own camp on Robert's horse. After some recollection however, he became reconciled to the prince and took him with him into England.

William returned in 1081; and being now freed from his enemies at home and abroad directed the formation of the celebrated DOMESDAY-BOOK. See that article. He reserved a very ample revenue for the crown; and, in the general distribution of land among his followers, kept possession of no fewer than 1400 manors in different parts of the country. No king of England was ever so opulent; none was able to support the splendor of a court to such a degree; none had so many places of trust and profit to bestow; and consequently none ever had more implicit obedience paid to his commands. He delighted greatly in hunting; and, to indulge himself in this with the greater freedom, he depopulated Hampshire for thirty miles, making the wretched outcasts of the villages no compensation for such an injury. In the time of the Saxon kings all noblemen had a right to hunt in the royal forests; but William appropriated the whole of these to himself, and published the first severe game laws. The killing of a boar, a deer, or even a hare, was punished with the loss of the delinquent's eyes; while the killing of a man might be atoned for by paying a moderate fine. The riches of his ministers, as we have intimated, were in proportion. Odo, bishop of Bayeux, William's brother, was so rich that he resolved to purchase the papacy. For this purpose, during the king's absence he equipped a vessel in the Isle of Wight, on board of which he sent immense treasures, and prepared for his embarkation. He was detained, however, by contrary winds, till William, being informed of his designs, resolved to prevent the exportation of so much wealth. Returning from Normandy, he came to England at the very time his brother was about to go on board. He immediately ordered him to be made prisoner; but his attendants, respecting the bishop's character, scrupled to execute his commands; so that the king was obliged to seize him with his own hand. Odo appealed to the pope: but the king replied, that he did not seize him as bishop of Bayeux, but as earl of Kent: and in that capacity, demanded an account of his administration. He was therefore sent prisoner to Normandy; and, notwithstanding all the threats of Gregory VII., was detained in custody during the remainder of William's reign. Soon after this, William experienced a severe blow in the death of his queen Matilda; and, almost at the same time, received information of a general insurrection in Maine. Upon his arrival on the continent, he found that the insurgents had been secretly excited by the king of France, who took all opportunities of lessening the Norman power. His indignation on this account was also increased by the accounts he received of some railleries thrown out against him by the French monarch. William, who was become corpulent, had been detained in bed by sickness; and Philip was heard to say, that he only lay in of a big belly. This so provoked the English monarch that he sent him word, he would soon be up, and at his churching present such a number of tapers as would set the kingdom of France in a flame. He accordingly levied a powerful army; and, entering the Isle of France, destroyed every thing with fire and sword. He took the town of Mante, and reduced it to ashes. But a period was now to be put at once to the conquests and the life of this great warrior. His horse happening in this neighbourhood to set his fore feet on some hot ashes, plunged violently, and the king was thrown

forward, and bruised on the pommel of the saddle. Being advanced in years, he felt apprehensive of the consequences, and ordered himself to be carried in a litter to the monastery of St. Gervaise. Here his illness increased; and, becoming sensible of the approach of death, he discovered great remorse on the review of his life, and endeavoured to make compensation by presents to churches and monasteries. He also gave orders for the liberation of several English noblemen, and was prevailed upon to restore his brother Odo, against whom he was much incensed. He left Normandy and Maine to his eldest son Robert. He wrote to Lanfranc, the primate, to crown William king of England. To Henry he bequeathed nothing but the possessions of his mother Matilda; but foretold, that one day he would surpass both his brothers in power and opulence. He expired on the 9th of September 1087, in the sixty-third year of his age, in the twenty-first of his reign over England, and fifty-fourth over that of Normandy.

The character of William I., given by the Saxon Chronicler, is striking. 'If any one wish to know what manner of man he was, or what worship he had, or of how many lands he was lord, we will describe him as we have known him: for we looked on him, and some while lived in his herd. King William was a very wise man and very rich, more worshipful and strong than any of his fore-gangers. He was mild to good men, who loved God: and slack, beyond all bounds, to those who withsaid his will.—He had earls in his bond, who had done against his will: bishops he set off their bishoprics: abbots off their abbotries: and thanes in prisons: and at last he did not spare his own brother Odo. Him he set in prison. Yet among other things we must not forget the good frith (peace) which he made in this land: so that a man, that was good for ought, might travel over the kingdom with his bosom full of gold without molestation: and no man durst slay another man, though he suffered never so mickle evil from the other. He ruled over England: and by his cunning he was so thoroughly acquainted with it, that there is not a hide of land, of which he did not know both who had it and what it was worth: and that he set down in his writings.—But he also set many deer-friths: and he made laws therewith that whoever should slay hart or hind, him man should blind.' 'His countenance,' says Dr. Lingard, 'wore an air of ferocity, which, when he was agitated by passion, struck terror into every beholder. The story told of his strength at one period of his life, almost exceeds belief. It is said that sitting on horseback he could draw the string of a bow, which no other man could bend even on foot. Hunting formed his favorite amusement.' The reader has seen the censure passed upon him for his deer-friths, and game-laws: nor will he think it undeserved, if he remember the circumstance already named of afforesting so much of Hampshire. The memory of this act of despotism has been perpetuated in the name of the New Forest, which it retains at the present after the lapse of 750 years.

William, surnamed Rufus, from his red hair, was in Normandy at the time of his father's death. He no sooner received the letter from Lanfranc, than he set out for England; where he arrived before the news of that event. Sensible that his brother Robert had a preferable title, he used the utmost despatch in getting himself crowned and established on the throne. The English were so effectually subdued, that they made no opposition, but the Norman barons were attached to Robert, who was brave, open, and generous. Even his predominant fault of indolence was not disagreeable to those haughty nobles, who affected an almost total independence of their sovereign. William, on the other hand, was violent, haughty, and tyrannical. A strong conspiracy therefore arose against him; and Odo, bishop of Bayeux, undertook to conduct it. Many of the most powerful nobility were concerned; and, as the confederates expected large succours from Normandy, they retired to their castles, and put themselves in an offensive posture. William, sensible of his danger, endeavoured to engage the English on his side, by promising the mitigation of their hardships. Robert, in the mean time, through his natural indolence, neglected to give his allies proper assistance. The conspirators were obliged to submit. Some of them were pardoned but most of them fined and their estates bestowed on the barons who had continued faithful to the king. William, freed from this danger, thought no more of his promises to the English. He proved a greater tyrant than his father; and after the death of Lanfranc, who had been his preceptor, and kept him within some bounds, he gave full scope to his rapacity. Not content with oppressing the laity, he invaded the privileges of the church; which in those days were held most sacred. He seized the temporalities of the vacant bishoprics and abbeys, and openly put up many of them to sale. These proceedings occasioned great murmurs, but the terror of his authority for a while preserved tranquillity. In 1090 the king thought himself strong enough to attempt the conquest of Normandy, which at that time was in the greatest confusion through the careless administration of Robert. Several of the barons had revolted, and were encouraged by the king of France. Robert also imagined he had reason to fear the intrigues of his brother Henry, whom for 3000 merks he had put in possession of Cottentin, nearly a third part of the duchy. He therefore threw him into prison; but when he found himself threatened with an invasion from William he gave Henry his liberty, and made use of his assistance in suppressing the insurrections of his subjects. But William was no sooner landed in Normandy, than the nobility on both sides interposed, and a treaty of peace was concluded. In this treaty Henry, finding his interests entirely neglected, suddenly retired to St. Michael's Mount, a strong fortress on the coast of Normandy, and infested the neighbourhood with his incursions. He was besieged by his two brothers, and obliged to capitulate; after which, being deprived of all his dominions, he wandered about for some time in great poverty. The peace between his brothers, however, was of short duration. Hostilities had occurred between England and Scotland, and these terminated in

the death of Malcolm III; after which new broils ensued with Normandy. William's rapacity prompted him to encroach upon his brother's territories, and to use a very extraordinary expedient to accomplish his designs. Having gone to Normandy to support his partisans, he ordered an army of 20,000 men to be raised in England, and conducted to the sea coast as if they were to be immediately embarked: but when they came there, instead of embarking, they were forced to pay the king 10*s*. a man; after which they were dismissed. With this money William engaged the king of France to depart from the protection of Robert; and bribed many of the Norman barons to revolt. He was called from Normandy, however, by an irruption of the Welsh; and, having repulsed them, was prevented from attempting other enterprises by a conspiracy of his barons. In 1096, however, the superstition of Robert put the king of England in possession of those dominions which he had not been able to conquer by force of arms. The crusades were now commenced, and Robert was desirous of undertaking an expedition into the Holy Land. As money for this purpose was wanting, he mortgaged his dominions to his brother for 10,000 merks. The king raised the money by violent extortions on his subjects; forcing even the convents to melt their plate, in order to furnish the quota demanded of them. He was then put in possession of Normandy and Maine; and Robert with a magnificent train set out for the east. After the death of Lanfranc, the king had retained in his own hands the revenues of Canterbury, as he had done those of many other bishoprics; but falling into a dangerous illness, he was seized with remorse; and the clergy represented to him that he was in danger of eternal perdition if he did not make atonement for the sacrilege of which he had been guilty. He therefore instantly resolved to supply the vacancy of Canterbury; and sent for Anselm abbot of Bec, who was much celebrated for his piety, to fill that see. This the abbot refused with great earnestness; fell on his knees, it is said, wept, and intreated the king to change his purpose; and when he found him obstinate in forcing the pastoral staff upon him, kept his fist so hard clenched that it required the utmost violence of the bystanders to open it, and force him to receive that ensign of spiritual dignity. William soon after recovered his health, and with it his violence and rapacity. As he now spared the church no more than before, a quarrel with Anselm soon ensued, which became more dangerous to the king, on account of the great character for piety which the primate had acquired. William was engaged in almost perpectual contests with this prelate. When these were pretty well settled, the king, who had undertaken an expedition into Wales, required Anselm to furnish him with a certain number of soldiers. The primate regarded this as an invasion of the rights of the church; and therefore, though he durst not refuse compliance, sent the men so miserably accoutred, that the king threatened him with a prosecution. Anselm on this demanded restitution of the church revenues which the king had seized, and appealed to Pope Urban II. The quarrel, at last, became so violent that the primate found it dangerous to remain in England. He desired and obtained the king's permission to retire beyond sea. On his departure his temporalities were immediately confiscated; but Urban received him as a martyr, and even threatened the king with excommunication. William, however, proceeded without regarding the threats of the Pope; who he knew was at that time much engaged with the crusades. Though his acquisition of Maine and Normandy had brought him into perpetual contests with the haughty and turbulent barons who inhabited those countries, and raised endless tumults and insurrections; yet William seemed intent on extending his dominions either by purchase or conquest. The earl of Poictiers and Guienne had resolved upon an expedition to the Holy Land; and, for this purpose, had put himself at the head of a vast multitude, consisting, according to some historians, of 60,000 horse, and a much greater number of foot. Like Robert of Normandy, he offered to mortgage his dominions for money sufficient to conduct this multitude into Asia. The king accepted this offer: and had prepared a fleet and army to take possession of these dominions, when an unfortunate accident put an end to his projects and his life. He was engaged in hunting, the sole amusement, and the principal occupation of princes in those rude times. Walter Tyrrel, a French gentleman remarkable for his skill in archery, attended him in this recreation, of which the New Forest was the scene. William had dismounted after a chase; and Tyrrel, impatient to show his dexterity, let fly an arrow at a stag which had suddenly started. The arrow glanced from a tree, and struck the king to the heart. He instantly fell down dead; and Tyrrel, terrified at the accident, clapt spurs to his horse, hastened to the sea shore, and embarked for France, where he joined the crusade that was setting out from that country. This happened on the 2nd of August, 1100, after he had reigned thirteen years, and lived about forty. His body was found in the wood by the country people, and buried without ceremony at Winchester. Dr. Lingard says, 'by whose hand the king fell, and whether the arrow was directed against him by accident or design, are questions which cannot be satisfactorily answered. The report, which obtained credit at the time, was, that William, following a wounded deer with his eyes, held his hand near his face to intercept the rays of the sun, and that at the same moment an arrow from the bow of Walter Tyrrel, a French knight, glancing from a tree, struck him in the breast. It was added that the unintentional homicide, spurring his horse to the shore, immediately crossed to the continent: and a pilgrimage, which he afterwards made to the Holy Land, was attributed to remorse, and construed into a proof of his guilt. But Tyrrel always denied the charge: and after his return, when he had nothing to hope or fear, deposed upon oath in the presence of Suger, abbot of St. Dennis, that he never saw the king on the day of his death, nor entered that part of the forest in which he fell. If William perished by treason (a supposition not very improbable)

it was politic in the assassin to fix the guilt on one, who was no longer in the kingdom. This at least is certain, that no enquiry was made into the cause or the manner of his death: whence we may infer that his successor, if he were not convinced that it would not bear investigation, was too well pleased with an event which raised him to the throne, to trouble himself about the means by which it was effected.' Vol. I. p. 486.

By the death of William, the crown of right devolved to Robert his eldest brother. But what Robert had formerly lost by indolence, he was now deprived of by superstition, being absent in the crusade. Henry being in the forest with William, when the latter was killed, immediately hurried to Winchester, and secured the royal treasure. William de Breteuil keeper of the treasure, arrived almost at the same instant, and opposed his pretensions; telling him that the money belonged to his elder brother, who was now his sovereign, and for whom he was determined to keep it. But Henry, drawing his sword, threatened him with instant death if he dared to disobey him; and others of the late king's retinue, who came every moment to Winchester, joining the prince's party, he was obliged to desist. Henry lost no time in accomplishing his purpose. In less than three days he was crowned king of England by Maurice bishop of London. Present possession supplied every deficiency of title; and no one dared to appear in defence of the absent prince. The beginning of Henry's reign promised to be favorable to English liberty; owing chiefly to the fear of his brother. To conciliate the affections of his subjects, he passed a charter to remove many of the grievous oppressions which had been complained of during the reigns of his father and brother. He promised, that at the death of any abbot or bishop, he never would seize the revenues of the see or abbey during the vacancy, but would leave the whole to be reaped by the successor; and that he would never let to farm any ecclesiastical benefice, or dispose of it for money. To the laity he pledged himself that upon the death of any earl, baron, or military tenant, his heir should be admitted to the possession of his estate, on paying a just and lawful relief, without being exposed to those enormous exactions which had been formerly required. He remitted the wardship of minors; and allowed guardians to be appointed, who should be answerable for the trust. He engaged not to dispose of any heiress in marriage but by advice of all the barons; and if any baron intended to give his daughter, sister, niece, or kinswoman, in marriage, it should only be necessary for him to consult the king, who promised to take no money for his consent, nor ever to refuse permission, unless the person to whom it was proposed to marry her should happen to be his enemy. He granted his barons and military tenants the power of bequeathing by will their money or personal estates; and, if they neglected to make a will, he promised that their heirs should succeed to them. He also renounced the right of imposing moneyage, and levying taxes, at pleasure, on the farms which the barons kept in their own hands; and he made general professions of moderating fines, &c. He offered a pardon for all offences; and remitted all debts due to the crown. On the behalf of the vassals of the barons, he stipulated that they should enjoy the same privileges which he granted to his own barons; and promised a general conformation to, and observance of, the laws of king Edward. To give greater authenticity to these concessions, a copy of the charter was lodged in one of the abbeys of each county. Henry, farther to increase his popularity, degraded and imprisoned Ralph Flambard bishop of Durham, who had been the chief instrument of oppression under his brother. He sent for Anselm, who was then at Lyons, inviting him to return and take possession of his dignities. Anselm returned: but when Henry proposed to him to do the same homage to him which he had done to his brother, the king met with an absolute refusal. During his exile, Anselm had assisted at the council of Bari: where, besides fixing the controversy between the Greek and Latin churches concerning the procession of the Holy Ghost, the right of election to church preferments was declared to belong to the clergy alone, and spiritual censures were denounced against all ecclesiastics who did homage to laymen for their sees and benefices, and on all laymen who exacted it. The rite of homage, by the feudal customs, was, that the vassal should throw himself on his knees, put his joined hand between those of his superior; and should, in that posture, swear fealty to him. See Feudal Tenure. But the council declared it execrable, that pure hands, which could create God, and offer him up for the salvation of mankind, should be put, after this humiliating manner, between profane hands, which, besides being inured to rapine and bloodshed, were employed, day and night, in impure purposes. To this decree, therefore, Anselm appealed; and declared, that so far from doing homage for this spiritual dignity, he would not even communicate with any ecclesiastic who paid that submission, or who accepted of investitures from laymen. Henry durst not persist; and therefore desired that the controversy might be suspended, and messengers be sent to Rome to accommodate matters with the pope, and obtain his confirmation of the laws and customs of England. The king now took another step, which seemed capable of confirming his claims to the crown without any danger of a rival. The English remembered with regret their Saxon monarchs, and compared the liberty they enjoyed under them with the tyranny of the Normans. Some descendants of that favorite line still remained; and among the rest Matilda, the niece of Edgar Atheling Upon her the king fixed his eyes as a proper consort, by whose means the breach between the Saxons and Normans might be cemented. A difficulty, however, occurred, because she had been educated in a nunnery. The affair was examined by Anselm in a council of prelates and nobles summoned at Lambeth. Matilda there proved, that she had put on the veil, not with a design of entering into a religious life, but merely in imitation of a custom familiar to the English ladies; who could only protect their chastity from the brutal violence of the Normans by taking shelter under that habit, which, amid the horrid licentiousness of the times,

was yet generally revered. The council, sensible that even a princess had otherwise no security for her honor, admitted this reason as valid. They pronounced that Matilda was still free to marry; and her nuptials with Henry were celebrated by Anselm with great solemnity and pomp. While Henry was thus rendering himself popular at home, his brother Robert, who had loitered away a twelvemonth in Italy, where he married Sibylla daughter of the count of Conversana, arrived in England in 1101, to put in his claim to the crown. His fame on account of the exploits he had performed in Palestine was so great, that even yet he was joined by many noblemen of the first rank, and the whole nation seemed prepossessed in his favor. But Henry having paid his court to Anselm, retained by his means the army in his interest, and marched with them to Portsmouth, where Robert had landed his forces a few days before. The armies lay for some time in sight of each other; when an accommodation was effected through the mediation of Anselm and the nobles. It was agreed by this treaty, that Robert should resign his pretensions to England, and receive in lieu of them an annual pension of 3000 marks; that if either of the princes died without issue, the other should succeed to his dominions; that the adherents of each should be pardoned; and restored to all their possessions either in Normandy or England; and that neither Robert nor Henry should henceforth encourage, receive, or protect, the enemies of each other. The two princes separated with mutual marks of friendship; but next year, Henry, under various pretences confiscated the estates of almost all the noblemen who had favored his brother. Robert, enraged at the fate of his friends, ventured to come to England to remonstrate against it. But he met with such a cool reception, that, apprehending his liberty to be in danger, he was glad to make his escape by resigning his pension. This infringement of the treaty was followed the next year by an invasion of Normandy by Henry, at the desire as it was alleged of Robert's own subjects. See NORMANDY. The event of this war was the defeat and captivity of Robert; who was henceforth deprived not only of all his dominions, but of his personal liberty. He lived twenty-eight years a prisoner, and died in the castle of Cardiff, in Glamorganshire. It is said by some writers that he was deprived of his sight by a red-hot copper basin applied to his eyes, and that king Henry appeased his conscience by founding the monastery of Reading. The conquest of Normandy was completed in 1106; and next year the controversy between the king and primate, concerning the investitures of clergymen and their doing homage to princes was resumed. The king was very sensible that it was not his interest to quarrel with such a powerful body as the clergy were at that time; on the other hand, he fully understood the necessity of guarding the prerogatives of the crown from their encroachments. While, therefore, he avoided an open rupture with Anselm he obstinately refused to give up the privileges which had been enjoyed by his predecessors. On the first arrival of the primate, the king had avoided the dispute in the manner already mentioned. A messenger was despatched to Rome, to compromise matters with the pope. The messenger returned with an absolute refusal of the king's demands. One of the reasons given by the pope on this occasion, was thus expressed: 'It is monstrous that a son should pretend to beget his father, or a man to create his God: priests are called gods in scripture, as being the vicars of God: and will you, by your abominable pretensions to grant them their investitures, assume the right of creating them?' Henry was not yet convinced; but as he was determined to avoid, or at least to delay the coming to any dangerous extremity with the church, he persuaded Anselm, that by farther negociations he should be able to compound matters with the pope. Messengers were therefore a second time despatched to Rome from the king, and from Anselm, who wanted to be fully assured of the pope's intentions. They returned with letters expressed in the most arrogant and positive manner both to the king and to the primate. The king suppressed the letter written to himself; and persuaded the three bishops, by whom it was sent, to assert, upon their episcopal faith, that the pope had assured them of his private good intentions towards king Henry, and of his resolution not to resent any future exertion of his prerogative in granting investitures; though he himself scrupled to give his assurance under his hand, lest other princes should copy the example and assume a like privilege. Anselm's two messengers, who were monks, affirmed that it was impossible this story could have any foundation; but their word was not deemed equivalent to that of three bishops; and the king, as if he had finally gained his cause, proceeded to fill the sees of Hereford and Salisbury, and to invest the new bishops in the usual manner. Anselm, however, gave no credit to the assertions of the king's messengers; and therefore refused not only to consecrate, but even to communicate with them; and the bishops themselves, finding they were become universally odious, returned the ensigns of their spiritual dignity. The quarrel continued between the king and the primate, till the latter, sensible of his dangerous situation, desired leave to make a journey to Rome, in order to lay the case before the pope. This permission was easily obtained; but no sooner was the primate gone, than Henry confiscated all his revenues, and sent another messenger to negociate with the pope. The new messenger told his holiness, that his master would sooner part with his crown than the right of granting investitures. 'And I,' replied the pope, 'would rather lose my head than allow him to retain it.' At last, however, the following compromise was made. Before bishops took possession of their dignities, they had formerly been accustomed to pass through two ceremonials: from the hands of the sovereign they received a ring and a crosier as the symbols of their office, and this was called their investiture; they also made those submissions to the prince, which were required of vassals by the rites of the feudal law, and which received the name of homage. The pope, therefore, was for the present contented with Henry's resigning his right of granting investitures, by which the spiritual dignity was supposed to be conferred;

and he allowed the bishops to do homage for their temporal properties and privileges. After this the pope directed Anselm to communicate with the prelates who had already received investitures from the crown; and he only required of them some submissions for their past conduct. He also granted to Anselm a plenary power of remedying every disorder which he said might arise from the barbarousness of the country. About the same time the marriage of priests was prohibited; and even laymen were not allowed to marry within the seventh degree of affinity. By this contrivance the pope augmented the profits which he reaped from granting dispensations, and likewise those from divorces. For as the art of writing was rare, and parish registers were not regularly kept, it was not easy to ascertain the degrees of affinity even among people of rank; and any man who had money to pay for it might obtain a divorce, on pretence that his wife was more nearly related to him than was permitted by the canons. A decree was also published, prohibiting the clergy to wear long hair; and the king, though he would not resign his prerogatives to the church, very willingly cut his hair in the form which was required of him, obliging all the courtiers, at the same time, to follow his example. From the time of this compromise, in 1107, to the year 1120, nothing remarkable distinguished this reign, except some slight commotions in Normandy; but in this last year prince William, the king's only son, was drowned off the coast of Normandy; and Henry was so much affected, that he is said never afterwards to have smiled, or recovered his wonted cheerfulness. It is probable, however, that the death of this prince was an advantage to the nation, as he had often expressed the utmost hatred to the English, and threatened, that when he came to the throne, he would make them draw the plough, and turn them into beasts of burden. These prepossessions he inherited from his father; who, though he pretended, when it might serve his purposes, to value himself on being a native of England, showed, in the course of his government, extreme prejudices against his countrymen. All hopes of preferment to ecclesiastical as well as civil dignities were denied to the English during his reign, and any foreigner, whatever his character, was sure of the preference. The charter, which the king had at first granted, fell so much into neglect and oblivion, that in the following century, when the barons desired to make it the model of the great charter which they exacted from John, they could only find one copy of it in England; while the grievances, proposed to be redressed by it, continued in their full extent, and were felt every where. As Henry had no legitimate children, except Matilda, whom, in 1120, he had betrothed, though only eight years of age, to the emperor of Germany, he was induced to marry a second time, in hopes of having sons. He accordingly allied himself with Adelina, the daughter of Godfrey, duke of Louvaine, and niece to pope Calixtus II. But she brought him no children; and, in 1135 the king died in Normandy, from eating too plentifully of lampreys, having lived sixty-seven years, and reigned thirty-five.

By the will of the deceased monarch, his daughter, Matilda, became heiress of all his dominions. She had been married, after her first husband's death, to Geoffrey Plantagenet, eldest son of the count of Anjou, by whom she had one son, named Henry; but as Geoffrey had given umbrage to the king of England in several instances, no notice was taken of him in the will. The nobility had already sworn fealty to her and the foremost, to show this mark of submission to the king's will, had been Stephen, son of the count of Blois, who had married Adela, the daughter of William the Conqueror. He had been married to Matilda, daughter and heiress of Eustace, count of Boulogne; who brought him, besides that feudal sovereignty of France, a vast property in England. By this marriage, Stephen also acquired a new connexion with the royal family of England; for Mary, his wife's mother, was sister to David, king of Scotland, and to Matilda, the first wife of Henry and mother of the empress. Henry likewise imagining, that by the aggrandisement of Stephen, he strengthened the interest of his own family, had enriched him with many possessions; but, instead of this, it appeared by the event, that he had only put it the more in his power to usurp the throne. No sooner was Henry dead, than Stephen hastened from Normandy to England. The citizens of Dover and Canterbury shut their gates against him; but when he arrived at London, the populace, instigated by his emissaries immediately proclaimed him king. The archbishop of Canterbury refused to give him the royal unction; but this difficulty was obviated by Stephen's brother, the bishop of Winchester. Hugh Bigod, steward of the household, made oath before the primate, that the late king, on his death-bed, had discovered a dissatisfaction with his daughter Matilda, and had expressed his intention of leaving the count of Boulogne heir to all his dominions; and the bishop, either believing, or pretending to believe this testimony, gave Stephen the royal unction. Very few of the nobility attended the coronation; but none opposed his accession openly. Stephen, to establish himself on the throne as firmly as possible, published a charter, in which, like his predecessors, he made liberal promises to all ranks of men. To the clergy, he promised that he would speedily fill all the vacant benefices, and never would levy any of the rents during the vacancy. To the nobility he gave liberty to hunt in their own forests; and to the people, a remittance of the tax of danegelt. He also engaged to restore the laws of Edward the Confessor. Having seized the king's treasure at Winchester, amounting to £100,000, he increased his army by mercenary soldiers from the continent; and procured a bull from the pope, confirming his title to the English throne. Matilda, in the mean time, was endeavouring to recover her rights; but for some time she met with no success, either in England or Normandy. Her husband Geoffrey himself was obliged to conclude a peace with Stephen, on condition of the king's paying him an annual pension of £5000. Robert, earl of Gloucester was the first who shook the power of the usurper. He was natural son to the late king; a man of

great honor and ability, and very much attached to the interests of Matilda. When Stephen ascended the throne, he offered to do him homage, and take the oath of fealty; but with a condition, that the king should maintain all his stipulations, and never invade any of the earl's rights or dignities. With this condition Stephen was obliged to comply, on account of the great power of this nobleman, though he knew that it was meant only to afford him a favorable opportunity of revolt. The clergy imitated Robert's example; and annexed to their oath of allegiance the condition, that they were only bound as long as the king defended the ecclesiastical liberties, and supported the discipline of the church. The barons, in return for their submission, were still more pertinacious. Many of them required to have the right of fortifying their castles, and putting themselves in a posture of defence; and with this exorbitant demand the king was forced to comply. All England was immediately filled with fortresses; which the nobles garrisoned either with their vassals, or with licentious soldiers, who flocked to them from all quarters. The whole kingdom became, therefore, a scene of rapine and devastation. Internal wars were carried on by the nobles in every quarter; the barons even assumed the right of coining money, and of exercising, without appeal, every act of jurisdiction; and the inferior gentry, as well as the people, finding no defence from the laws, during this total suspension of sovereign power, were obliged, for their immediate safety, to pay court to some neighbouring chieftain, and to purchase his protection by submitting to his exactions. In 1137 the earl of Gloucester, having projected an insurrection, retired beyond sea, sent the king a defiance, and solemnly renounced his allegiance. The next year David, king of Scotland, appeared with an army in defence of his niece's title; and penetrating into Yorkshire, committed the greatest devastations. He was defeated, however, with great slaughter at Northallerton, by the northern barons, who had raised a powerful army; and this success so much overawed the malcontents in England, that Stephen's power might yet have become stable, had he not engaged in a contest with the clergy. He had seen the mischief arising from the liberty he had granted of fortifying so many castles: he, therefore, determined to abridge this as much as possible; and, for that purpose, began with those erected by the clergy. Taking advantage of an affray, which had arisen at court, between the retinues of the bishop of Salisbury and the earl of Brittany, he seized the bishops both of Salisbury and Lincoln, threw them into prison, and obliged them to deliver up the castles which they had erected. This produced such a violent commotion, that the opportunity seemed favorable to the pretensions of Matilda. On the 22d of September, 1139, she landed in England, with Robert, earl of Gloucester, attended only by 140 knights; but her partisans daily increased, and she was soon in a condition to meet Stephen with an equal force. Numberless minor encounters happened in the interior. War was spread through every quarter; and the turbulent barons having, in a great measure, shaken off the restraint of government, under the pretended sanction of fighting in the cause of their country, redoubled their oppressions and devastations. Their castles became receptacles of licensed robbers; who, sallying forth day and night, spoiled the open country, and plundered the villages and towns. They tortured captives to make them reveal their treasures, or sold their persons into slavery; and set fire to the most respectable houses, after pillaging them of every thing. The land, in consequence, was now left extensively untilled; the instruments of husbandry were abandoned, and a famine reduced the nation to a most deplorable state. A decisive battle between the competitors for the crown seemed, at last, to be the best hope of the nation. Stephen had marched his forces to relieve the city of Lincoln, and the earl of Gloucester led a body of troops to assist those of Matilda's party, who were besieging that place. The two armies engaged on the 2d of February, within sight of the city, and a desperate conflict ensued. At last, Stephen's army was defeated. He himself, at one period, was left without attendants, and fought on foot in the midst of his enemies; assaulted by multitudes, and resisting their attacks with great bravery. For some time he forced a passage with his battle-axe, but that breaking, he drew his sword, and furiously assailed his antagonists; until at length, this weapon also failing him, he was obliged to surrender himself prisoner. He was conducted to Gloucester, and though at first treated with respect, was in a short time thrown into irons, and in the month of March Matilda was crowned at Winchester with great solemnity. She now determined to repress the power of the nobles, but was destitute of policy or prudence sufficient to accomplish so difficult an undertaking, and a conspiracy was formed against her. The bishop of Winchester detached a party of his friends and vassals to block up the city of London, where the queen resided; measures were at the same time taken to instigate the Londoners to a revolt, and to seize her person. Matilda, having timely notice of this, fled to Winchester. Here she was soon after besieged by the bishop; but the town being distressed by famine, she made her escape: while the earl of Gloucester, endeavouring to follow her, was taken prisoner, and exchanged for Stephen. Matilda being at length obliged to take shelter in Oxford, Stephen reascended the throne: again, however, the civil war broke out with redoubled fury. Many battles were fought, and both parties were at times involved in great difficulties. Matilda, it is said, escaped from Oxford at a time when the fields were covered with snow, by being dressed in white, with four knights, her attendants, dressed in the same color. Another time Stephen was surprised by the earl of Gloucester at Wilton, and made his escape with the utmost difficulty. At last Matilda was obliged to quit the kingdom; and the death of the duke of Gloucester soon after, seemed to give a fatal blow to her interests. In 1155, however, prince Henry, her son by her husband Geoffrey, came over to England, to dispute, once more, Stephen's pretensions to the crown. After some success on his first landing, he was opposed by Stephen

with a powerful army, and matters seemed again likely to come to the decision of a general engagement. But while the two armies were within a quarter of a mile of each other, a treaty was proposed by the interposition of William, earl of Arundel, and the death of Eustace, Stephen's son, which happened in the course of the negociation, facilitated its conclusion. It was agreed that Stephen should reign during his life, and that justice should be administered in his name; that Henry, on Stephen's death, should succeed to the kingdom; and that William, Stephen's son, should inherit Boulogne and his patrimonial estate. This treaty filled all England with joy; and after the barons had sworn to it, Henry left England, and Stephen returned to the peaceable enjoyment of his throne. His reign, however, was but short, as he died on the 25th of October, 1154.

5. *Of England under the House of Plantagenet.*—Henry II. was on the continent besieging a castle of one of the mutinous barons, when news was brought him of Stephen's death. But, as he had no reason to suppose that his title would be disputed, he did not abandon his enterprise till the place was reduced. He then set out on his journey, and was received in England with the greatest cordiality. The first acts of his reign promised a happy administration. He dismissed at once the mercenary soldiers who had committed the greatest disorders; ordered all the castles which had been erected since the reign of Henry I. to be demolished, except a few which he retained in his own hands; and called in the adulterated coin which had been struck during the reign of Stephen. Resuming many of the benefactions which had been made to churches and monasteries, he gave charters to several towns, and granted the citizens their freedom and privileges independent of any superior but himself. These charters became an important ground-work of English liberty; for thus a new order, namely, the more opulent of the people, began to claim a share in the administration, as well as the nobility and clergy. Thus the feudal government also was at first impaired; and freedom, as well as property, more equally diffused. Henry, on his accession to the English throne, found himself possessed of very extensive dominions on the continent. In right of his father, he possessed Anjou, Touraine, and Maine; in that of his mother Normandy; in that of his wife, Guienne, Poictou, Saintogne, Auvergne, Perigord, Angoumois, and Limousin. Soon after he annexed Brittany to his other states, by marrying his son, who was yet a child, to the heiress of Brittany. His territories composed above a third of the French monarchy, and were by far the most opulent part of it; so that Henry, though nominally a vassal to the king of France, was greatly his superior in power; and, when England was added to these, Louis VII. had great reason to consider him capable of becoming a powerful enemy. The king of England, however, soon became a kind of stranger in his continental dominions; and his subjects there, considering their allegiance as more naturally due to their superior lord, always looked up to the king of France with attachment, and acknowledged him to be the chief of their nation. Their immediate lord was often at too great a distance to protect them; and a commotion was more easily raised than quelled in any part of his extensive dominions. But the wise and vigorous administration of this prince counterbalanced in a great measure these disadvantages; and he maintained a surprising tranquillity throughout his dominions during the greatest part of his reign. In the task to which he first devoted himself, i. e. circumscribing the power of the barons, he found no great difficulty; but, when he attempted to control the clergy, he met with the most violent opposition. That body had carried their independence on the civil power so far, that they now seemed to aim at nothing less than a liberty to commit any crime with impunity. During the reign of Stephen, they had extorted an immunity from all but ecclesiastical penalties, and that grant they were resolved to maintain. It may easily be supposed, that a law which thus screened their delinquencies contributed to increase them; and it has accordingly been said that not less than 100 homicides were committed by men in holy orders, within a period of ten years after the king's accession. Henry did not commence his more important attempts to remedy this state of things during the life of Theobald, archbishop of Canterbury, who was a man of a mild character, and had the merit, during the former reign, of having refused to crown Eustace, Stephen's son. He died in 1162; and the king now selected the celebrated Thomas à Becket, his chancellor, to fill the vacant see. The new archbishop was the first man of English pedigree, who, since the Norman conquest, had risen to any considerabl[e] station. Before his instalment as archbishop h[e] had been for some time archdeacon of Canterbury but had never taken priest's orders, and occupie[d] himself of late with the king's political affai[rs] altogether. He had even just successfully con[-]cluded a campaign, in which he took the com[-]mand of a considerable force, in Normandy. While we may blame his subsequent conduc[t] it is but fair to state the allegations of the Catho[-]lic historians:—that Becket, at this time, mos[t] reluctantly accepted the proffered mitre; that o[n] the king's first intimation of the offer to him h[e] observed, 'that he had not much the appearanc[e] of an archbishop, and that, if the king wer[e] serious, he must beg permission to decline th[e] preferment, because it would be impossible fo[r] him to perform the duties of the situation, and at the same time, retain the favor of his bene[-]factor.' Henry, however, was inflexible: h[e] had hesitated on whom to bestow the see fo[r] thirteen months, and probably did not think hi[s] former humble companion serious: the papa[l] legate, Henry of Pisa, is said to have added hi[s] entreaties, and Becket was induced to acquiesc[e] No sooner, however, was he invested with th[e] high dignity, than he totally altered his conduc[t] and assumed all those austerities, and that appare[nt] humility of demeanor, which would recommen[d] him to the superstitious and ignorant multitude He at once resigned the office of chancellor withou[t] consulting the king; and seems to have though[t] that as the king intended to abridge the ecclesia[s-]

tical power, he had best himself become the aggressor, and exhibit, at once, his own determination to maintain it. He therefore summoned the earl of Clare to surrender the barony of Tunbridge; which, ever since the conquest, had remained in the family of that nobleman; but which, as it had formerly belonged to the see of Canterbury, his predecessors, as the primate contended, were prohibited from alienating. William de Eynsford, a military tenant of the crown, was also patron of a living which belonged to a manor held of the archbishop of Canterbury; and Becket, without regard to that chieftain's right, presented one Laurence to the living, who was violently expelled by Eynsford. Becket, upon this, excommunicated the latter, who complained to the king that he, who held in capite of the crown, should, contrary to the practice established by the Conqueror, and maintained ever since by his successors, be subjected to such a sentence without the previous consent of the sovereign; and Henry commanded Becket to absolve Eynsford. The haughty primate, however, answered, that it belonged not to the king to inform him whom he should absolve, and whom excommunicate: but after all he was, in this case, obliged to comply with the king's orders. Henry perceiving now that the crown was in danger, through the superstition of the people, of falling totally under the power of the clergy, resolved to exert himself to the utmost against their scandalous usurpations. Among other modes of aggrandisement they had inculcated the necessity of penance as an atonement for sin; and having introduced the practice of paying them large sums, as an equivalent for penances, the crimes of the people had become a source of important revenue to the priests: the king computed, that, by this invention alone, they levied more money from his subjects than what flowed from all the funds and public taxes into the royal exchequer. To ease the people of so heavy and arbitrary an imposition, the king required, that a civil officer of his appointment should be present, in all ecclesiastical courts, and should for the future give his consent to every composition made for spiritual offences. About this time, also, Henry had an opportunity of proceeding against the clergy on another ground. A clergyman of Worcester having debauched a gentleman's daughter, murdered her father; and the king required that he should be delivered up to the magistrate. Becket pleaded the privileges of the church; confined the criminal in the bishop's prison, lest he should be seized by the king's officers; and maintained that no greater punishment could be inflicted on him than degradation. The king then demanded that, immediately after he was degraded, he should be tried by the civil power; but the primate asserted, that it was iniquitous to try a man twice upon the same accusation, and for the same crime. Upon this, Henry summoned an assembly of all the prelates in England; and put to them this decisive question:—Whether or not they were willing to submit to the ancient laws and customs of the kingdom? The bishops unanimously replied, that they were willing, saving their own order. The king was provoked at this equivocal answer. He left the assembly with evident marks of displeasure; and required the primate instantly to surrender the castles of Eye and Berkham. The other prelates were terrified; but Becket continued inflexible; however, he was at last prevailed upon, by the interposition of Philip, the pope's legate and almoner, to retract the saving clause, and promise, without any reserve, to observe the ancient customs. But the king was not now to be satisfied with general promises. He was determined that the ancient laws and customs should be defined, as well as the privileges of the clergy. He therefore summoned a council of the clergy and nobility at Clarendon, to whom he submitted this important affair. Many excellent legal propositions were here drawn up, which were afterwards known by the title of the Constitutions of Clarendon. By these it was enacted, that clergymen accused of any crime should be tried in the civil courts; that laymen should not be tried in spiritual courts, except on the testimony of legal and reputable witnesses; that the king should ultimately judge of ecclesiastical and spiritual appeals; that the archbishops and bishops should be regarded as barons, and obliged to contribute to the public expenses like other persons of their rank; that the goods forfeited to the king should not be protected in churches or church-yards by the clergy; and that the sons of villeins should not take orders without the consent of their lord. These, with some others of less consequence, to the number of sixteen, were subscribed by all the bishops present, and even by Becket himself; though he at first showed considerable reluctance to sanctioning them. Nothing now remained but to obtain their ratification by the pope; but in this the king was disappointed. The pope, with the utmost indignation, rejected them; and, out of sixteen, admitted only six, which he thought were not important enough to deserve censure. Becket was also now mortified to the highest degree. He retracted his consent to the constitutions, redoubled his austerities, and even refused to execute any part of his sacerdotal function till he had obtained absolution from his holiness. Henry, considering these humiliations as insults offered to himself, desired the pope to send him a legate. He did so; but annexed a clause to his commission, by which he was prohibited from acting against the archbishop of Canterbury. The king on this sent back the commission to the pope; and, being exasperated beyond all patience, commenced prosecution against Becket. He first sued him for some lands belonging to his primacy; and Becket being detained by sickness from coming into court, his non-attendance was construed into disrespect. The primate afterwards defended his cause in person; but all his goods and chattels were confiscated, and the bishop of Winchester was obliged to pronounce the sentence. Another suit was commenced against him for £300, which he had levied on the honors of Eye and Berkham, and the primate agreed to give securities for the payment of the sum. The next day a third suit was commenced against him for 1000 merks, which the king had lent him; and, upon the back of these, a still greater demand

was made; namely, that Becket should give an account of the money he had received and expended during the time he was chancellor. This was computed at no less than 40,000 merks; and the primate, unable either to give an account, or to find securities, took the following extraordinary method of evading the difficulty:—He arrayed himself in his episcopal vestments; and, with the cross in his hand, went to the royal palace. Having entered an apartment near the council-room, he sat down holding up the cross as his banner and protection. The king, who sat in an inner apartment, ordered by proclamation all the prelates and nobility to attend him; to whom he loudly complained of Becket's insolence. The whole council joined in condemning his unaccountable pride; and determined to expostulate with him about his inconsistency concerning the constitutions of Clarendon. But all these messages, threats, and arguments, were to no purpose. Becket put himself, in the most solemn manner, under the protection of the supreme pontiff, and appealed to him against any penalty which his iniquitous judges in England might think proper to inflict. Then leaving the palace, he asked the king's immediate permission to quit Northampton; but being refused, he secretly withdrew, and at last found means to cross over to the continent.

Becket was received with the greatest marks of esteem, as well by the king of France, who hated Henry, as by the pope, whose cause he had so strenuously defended; nor is it to be forgotten that there was at this period a schism in the papacy itself; and Becket had decided for the strongest and ultimately successful side. Henry at the same time sent ambassadors to the pope, who were treated with coolness and contempt, while Becket was honored with the greatest marks of distinction. These favors bestowed upon an exile and perjured traitor (for such had been Becket's sentence of condemnation in England) irritated the king to such a degree, that he rashly resolved to throw off at once all dependence upon the papal see. He accordingly issued orders to his justiciaries, inhibiting, under severe penalties, all appeals to the pope or the archbishop; and forbidding any of them to receive mandates from them, or to apply to them for any ecclesiastical authority. He further declared it treasonable to bring over from either of them any interdict upon his kingdom. In secular clergymen he made this punishable by the loss of their livings, and castration; in regulars, by the amputation of their feet; and in laymen, by death. On the other hand the pope and the archbishop did not fail to issue their fulminations in such a manner as to shake the foundations of the king's authority. Becket excommunicated by name all the king's chief ministers, who had been concerned in sequestrating the revenues of his see, and all who obeyed or favored the constitutions of Clarendon. He even threatened to excommunicate the king himself, if he did not speedily repent; and had not the pope been threatened every day with the machinations of the antipope, whose pretensions he was afraid the king of England might support, that terrific sentence would certainly have been pronounced. At first, Henry paid little regard to these measures; but afterwards, when he found that his authority over his subjects was endangered by them, and that his rivals on the continent were prepared to take advantage of their effects, he began to desire a reconciliation. This the pope and Becket also desired when they found their utmost efforts of such little present influence. At length, by the mediation of the pope's legate, the differences were adjusted, the king declared to be reconciled to the papal see, and Becket re-instated in that of Canterbury. On the recovery of his dignity, the primate behaved with his former arrogance. He returned in great state to England, and made a splendid progress through Kent. As he approached Southwark, the clergy, gentry, and all ranks of people came forth to meet him, and celebrate his triumph. Being thus confident, as he thought, of the support of the people, he resolved to make his enemies feel the effects of his vengeance. He suspended the archbishop of York, who had crowned Henry's eldest son in his absence, and excommunicated the bishops of London and Salisbury, with some of the principal nobility and prelates who had assisted at that ceremony. One man he excommunicated for having spoken againt him, and another, it is said, for having cut off the tail of one of his horses. The excommunicated prelates hastened with their complaints to the king, then in Normandy; and he, having (as we have seen, article Becket), dropped some expressions intimating his impatience and surprise that 'no one would rid him of this turbulent priest,' his supposed will was quickly accomplished. Becket fell beneath the blows of four assassins, who came from Normandy to England on this bloody errand, and who dashed out his brains on the pavement of his own cathedral.

The story of this murder is told in Dr. Lingard's best manner:—'The next day, about two in the afternoon, the knights abruptly entered the archbishop's apartment, and neglecting his salutation seated themselves on the floor. It seems to have been their wish to begin by intimidation: but if they hoped to succeed, they knew little of the intrepid spirit of their opponent. Pretending to have received their commission from Henry, they ordered the primate to absolve the excommunicated prelates. He replied with firmness, and occasionally with warmth, that if he had published the papal letters, it was with the royal permission: that the case of the archbishop of York had been reserved to the pontiff: but that he was willing to absolve the others on condition that they previously took the accustomed oath of submitting to the determination of the church. It was singular that of the four knights, three had, in the days of his prosperity, spontaneously sworn fealty to him. Alluding to this circumstance, he said as they were quitting the room, 'knowing what has passed between us, I am surprised you should come to threaten me in my own house.'—'We will do more than threaten,' was their reply.—'When they were gone his attendants loudly expressed their alarms: he alone remained cool and collected, and neither in his tone or gesture

betrayed the slightest symptom of apprehension. In this moment of suspense the voices of the monks singing vespers in the choir struck their ears, and it occurred to some one that the church was a place of greater security than the palace. The archbishop, though he hesitated, was borne along by the pious importunity of his friends: but when he heard the gates close behind him, he instantly ordered them to be re-opened, saying, that the temple of God was not to be fortified like a castle. He had passed through the north transept, and was ascending the steps of the choir, when the knights with twelve companions, all in complete armour, burst into the church. As it was almost dark, he might, if he had pleased, have concealed himself among the crypts, or under the roof: but he turned to meet them, followed by Edward Grim, his cross-bearer, the only one of his attendants who had not fled. To the vociferations of Hugh of Horsea, a military subdeacon, 'Where is the traitor?' no answer was returned: but when Fitzurse asked, 'Where is the archbishop?' he replied: 'Here I am, the archbishop, but no traitor. Reginald, I have granted thee many favors. What is thy object now? If you seek my life, I command you, in the name of God not to touch one of my people.' When he was told that he must instantly absolve the bishops, he answered, 'Till they offer satisfaction, I will not.'—'Then die!' exclaimed the assassin, aiming a blow at his head. Grim interposed his arm, which was broken, but the force of the stroke bore away the primate's cap and wounded him on the crown. As he felt the blood trickling down his face, he joined his hands, and bowed his head, saying, 'In the name of Christ and for the defence of his church I am ready to die.' In this posture, turned towards his murderers, without a groan and without a motion, he awaited a second stroke, which threw him on his knees: the third laid him on the floor at the foot of St. Bennet's altar. The upper part of his scull was broken in pieces: and Hugh of Horsea planting his foot on the archbishop's neck, with the point of his sword drew out his brains, and strewed them over the pavement.'

The king was thrown into the utmost consternation on hearing of Becket's murder. He foresaw that the primate's death would accomplish what his most violent opposition during his life could never have done, and gave himself up to bitter regret; for three days he is said to have refused his usual food; till at last his courtiers were obliged to break in upon his solitude, and induce him to acquiesce in an event which could not possibly be recalled. The pope was with some difficulty made sensible of his innocence; but refused to be reconciled to him, except on condition that he should become more obedient to the holy see. The murderers, according to Hume, after performing the penance imposed on them by the Pope, continued to possess, without molestation, their honors and their fortunes, and even regained the good opinion and countenance of the public. There is no proof of this. On the contrary, they were ordered to make a pilgrimage to Jerusalem, where most, if not all of them, died.

Henry, with a view to divert his own mind, as well as that of the people, to a different object, now undertook an expedition into Ireland, and totally reduced that country. See Ireland. Scarcely was he returned from this war, and the dangerous controversy in which he had engaged with the church of Rome, when he found himself involved in the most unnatural contest with his children, to whom he had always behaved most affectionately. He had ordered Henry his eldest son to be anointed king; and had destined him for his successor in England, Normandy, Anjou, Maine, and Touraine. Richard, his second son, was invested with the duchy of Guienne and county of Poictou: Geoffrey, his third son, inherited, in right of his wife, the duchy of Brittany; and the new conquest of Ireland was destined for John, his fourth son, for whom he had also negociated a marriage with Adelais, the only daughter of Humbert, count of Savoy and Maurienne; stipulating that he should receive as a dowry, very considerable demesnes in Piedmont, Savoy, Bresse, and Dauphiny. This extending greatness of Henry's family alarmed the king of France; and he therefore now excited prince Henry to demand of his father, the immediate resignation either of the crown of England, or the duchy of Normandy. When the king refused to comply with this extravagant demand, the prince made his escape to Paris, where he was protected by the French monarch. This was in 1173; and the same year, queen Eleanor, finding herself on disagreeable terms with the king, encouraged her two younger children, Geoffrey and Richard, to demand the territories designed them, and fly to the court of France. The queen herself designed to accompany them, and had disguised herself in male attire for that purpose, when she was seized and confined by Henry's order. The licentious barons in the mean time wished for a change of government; and hoped, under young and inexperienced princes, to renew their former depredations. In the midst of this universal defection, however, the English monarch retained his usual intrepidity, and prepared with vigor for the possible contest. As he could depend on the fidelity of very few of his nobility, he was obliged to enlist in his service a number of desperate mercenaries, called Brabençons, or Brabanciones, a race of Netherland soldiery, infamous for rapine; and 20,000 of these, with a few forces furnished by his faithful barons, composed the whole of his army. With these, however, he totally overthrew the schemes of his enemies on the continent; but, being desirous of putting an end to the war, he the same year, 1173, agreed to a conference with the king of France. At this interview, Henry offered his children the most advantageous terms. He insisted only on retaining the sovereign authority in all his dominions. To Henry he offered half the revenues of the crown of England, with various strong places in that kingdom; or, if he chose rather to reside in Normandy, half the revenues of that duchy, with all those of Anjou. He made a like offer to Richard in Guienne; he promised to resign all Brittany to Geoffrey; and, if these concessions were not deemed sufficient, agreed to add to them whatever the pope's legates,

who were present, should require of him. The conference, however, was broken off by the violence of the earl of Leicester; who not only reproached Henry in the most indecent manner, but even put his hand to his sword, as if threatening violence against him. In the mean time, most of the English nobility united in opposition against their sovereign; and an irruption made into the north of England at this time, by William king of Scotland, assisted their rebellious schemes. The earl of Leicester soon after invaded Suffolk at the head of a body of Flemings, but they were repulsed with great slaughter, and the earl himself was taken prisoner. The king of Scotland, who had been repulsed, now agreed to a cessation of arms, but broke the truce, and again invaded England with an army of 80,000 men. Henry in the mean time, to reconcile himself thoroughly to the church, performed penances at the tomb of Becket. As soon as he came within sight of the cathedral of Canterbury, he alighted from his horse, walked barefoot into the town, and prostrated himself before the shrine of the newly made saint. He remained a whole day in prayer and fasting, and watched the relics all night; made a grant of £60 a-year to the convent for a constant supply of tapers to illuminate the shrine; and assembled a chapter of the monks, before whom he disrobed himself, putting a scourge into each of their hands, and presenting his bare shoulders to their strokes. Next day he received absolution; and, departing for London, had the agreeable news brought to him of the defeat and captivity of William of Scotland. The victory proved decisive in Henry's favor. The English barons, who had volted, or were preparing for a revolt, instantly, therefore, delivered up their castles to the victor, and the kingdom was in a few weeks restored to perfect tranquillity. Prince Henry, who was ready to embark with a considerable army to join the English rebels, abandoned all thoughts of the enterprise; and soon after a treaty was concluded with the king of France, in which Henry granted his children much less advantageous terms than had been rejected by them. The principal were, some pensions for their support, castles for their residence, and an indemnity to all their adherents. The greatest sufferer by this war was William, king of Scotland. He was compelled to sign a treaty, by which he obliged himself to do homage to Henry for his kingdom. It was also agreed that his barons and bishops should do homage to the English crown, and that the fortresses of Edinburgh, Stirling, Berwick, Roxburgh, and Jedburgh, should be delivered into the hands of the conqueror till these stipulations were performed. This treaty was executed most punctually on the 10th of August, 1175, in the cathedral of York.

Henry was thus freed from all his greater troubles at home and abroad for five years, during which several salutary laws were made. But, in 1180, the ambition of his children involved him in fresh calamities. Richard, who had been invested by his father with the sovereignty of Guienne, refused to do homage to his elder brother, and young Henry and Geoffrey, uniting their arms, invaded his dominions. While the king was endeavouring to compose these differences, he found himself once more conspired against by all his children. The conspiracy, however, was defeated by the death of prince Henry in 1183. He had retired to Martel, a castle near Turenne, where he was seized with a fever; and, perceiving the approaches of death, was struck with remorse for his undutiful behaviour to his father. He sent a messenger to the king, who was not far distant, expressing contrition for his faults, and entreated the favor of a visit, that he might at least die with the satisfaction of having received forgiveness. But the king, who had so often experienced his son's ingratitude and violence, conjecturing that his sickness was feigned, dared not trust himself in the prince's hands. Soon after, however, receiving intelligence of his death, and proofs of his sincere repentance, he was affected with the deepest sorrow. This prince, who died in the twenty-eighth year of his age, left no posterity. His brother Richard succeeded to his dominions, and soon discovered as turbulent a spirit. He refused to give up Guienne, which Henry had designed for his fourth son, John; and even made preparations for carrying on war against his father and brother Geoffrey. Henry sent for Eleanor, his queen, the heiress of Guienne, to whom Richard, either dreading an insurrection in her favor, or out of a sense of duty, willingly yielded up the territory, and retired peaceably to his father' court. This breach, however, was no sooner made up, than Geoffrey demanded Anjou to be added to his dominions in Brittany. This the king refused; upon which he fled to the court of France, and prepared to levy an army against his father, but was soon after killed in a tournament. His death gave few, except the king, any uneasiness; for he was universally hated, and is said to have been known among the people by the name of the Child of Perdition. The widow of Geoffrey, soon after his decease, was delivered of a son, named Arthur, who was invested in the duchy of Brittany, under the guardianship of Henry his grandfather, who, as duke of Normandy, was also superior lord of that territory. Philip II., king of France, as lord paramount, disputed for some time, his title to this wardship; but was obliged to yield to his claim, the Britons preferring the government of Henry. Other causes inflamed the dissension between the two monarchs, and Philip once more seduced Richard from his duty. He insisted that his marriage with Adelais, Philip's sister, should be immediately completed, and threatened to enforce his pretensions with a formidable army. This occasioned another conference at the usual place of meeting, between Gisors and Trie, under an elm, that is said to have shaded more than an acre. In the midst of this conference the archbishop of Tyre appeared before the assembly in a miserable habit, and begged assistance against the infidels, who, under Saladin, had almost totally expelled the Christians from Asia. His intelligence was so dismal, that the kings of France and England are said to have at once laid aside their animosity, and both of them immediately took the cross. But Richard, who had long wished to have all the glory of such an expedition to himself, could not bear to have even his

father for a partner in the undertaking. He therefore entered into a confederacy with the king of France, which obliged Henry to give up all thoughts of the crusade, to defend his own dominions. The event of the war proved very unfortunate for Henry, who lost several towns, and narrowly escaped falling into the hands of the enemy. At last a treaty was concluded at the intercession of the duke of Burgundy, the count of Flanders, and the archbishop of Rheims, but upon terms very humiliating to the king of England. It was agreed, that Richard should marry the princess Adelais, and be crowned king of England during the lifetime of his father; that Henry should pay 20,000 merks to the king of France, as a compensation for the charges of the war; that his own barons should engage to make him observe this treaty, and, in case of his violating it, join Philip and Richard against him; and that all his vassals who had espoused the cause of Richard should receive an indemnity. These terms, mortifying as they were, Henry bore with patience; but when, upon receiving a list of the barons that were to be pardoned, he found his own son John, who was his favorite, among them, he could no longer support his grief. He broke out into the most lamentable expressions of despair, cursed the day in which he received his miserable being; and bestowed on his ungrateful children a malediction which he could never afterwards be prevailed upon to retract. Soon after he fell into a lingering fever occasioned by his grief; of which he died on the sixth of July, 1189, in the fifty-eighth year of his age, and thirty-fifth of his reign. His natural son, Geoffrey, who alone had behaved dutifully towards him, attended his corpse to the nunnery of Fontevrault, where it lay in state in the abbey church. Next day Richard, who came to visit the dead body of his father, was struck with remorse at the sight; and some writers state, that at his approach, the blood gushed out at the mouth and nostrils of the corpse.

Richard I. succeeded his father without opposition, and, on his accession, set his mother Eleanor (who had been again confined) at liberty. A romantic desire for adventures, and an immoderate zeal for the external rites of religion, were the ruling passions of the time. By the first of these Richard was inflamed to the highest degree, and therefore behaved as if the whole design of his government had been to attempt the recovery of the Holy Land from the infidels. The superstition of the people showed itself in a most violent and tragical manner, on the very day of the king's coronation. The Jews were the objects of universal hatred, so that Richard had issued orders forbidding any of them from appearing at that ceremony. But some of them, bringing him large presents from their nation, presumed, notwithstanding these orders, to approach the hall in which he dined. Being discovered, they were exposed to the insults and injuries of the bystanders; in consequence of which they fled, and were pursued by the people. A report was spread that the king had given orders to massacre all the Jews. This supposed command was executed in the most cruel manner. Multitudes were slaughtered in the city of London, and this example was followed in most of the chief towns in England. Five hundred Jews had retired into York castle for safety; but, finding themselves unable to defend the place, they murdered their wives and children—threw the dead bodies over the wall against their enemies, who attempted to scale it—and then, setting fire to the houses, perished in the flames. The gentry in the neighbourhood, who were all indebted to the Jews, ran to the cathedral, where their bonds were kept, and made a solemn bonfire of them before the altar.

Richard immediately began to take measures for his expedition into Palestine. His father had left him 100,000 merks; and this sum he augmented by every possible expedient, however pernicious to the public or dangerous to his own authority. He made sale of the revenues and manors of the crown, and several offices of the greatest trust and power. Liberties, charters, castles, were given to the best bidders. His friends warned him of the danger attending his venality; but he told them he would sell the city of London itself, if he could find a purchaser. A zealous preacher of those times, being emboldened to remonstrate against the king's conduct, advised him to part with his three daughters, pride, avarice, and sensuality. To this Richard readily replied, 'You counsel right, my friend: and I have already provided husbands for them all. I will dispose of my pride to the templars; my avarice to the monks; and as for my sensuality, the clergy shall share that among them.' At length the king, having collected together a sufficient supply, and even sold his superiority over Scotland for a moderate sum, set out for the Holy Land; whither he was impelled by repeated messages from the king of France, who was ready to embark in the same enterprise. An account of his exploits in this expedition is given under the articles ACRE, CYPRUS, and EGYPT. Having at last concluded a truce with Saladin, he set out on his return for England. He was, however, at a loss how to proceed. He durst not return by the way he came, as this would have put him in the power of the king of France, between whom and himself an irreconcileable enmity had taken place. He, therefore, decided upon a more northern course, and took shipping for Italy, but was wrecked near Aquileia. Thence he travelled towards Ragusa, and resolved to make his way through Germany in the habit of a pilgrim. But his expenses and liberalities having betrayed his rank, he was arrested by Leopold duke of Austria, who actually loaded him with chains. This prince had served under Richard at the siege of Acre, where having received some disgust, he took this base method of revenge. Henry VI., emperor of Germany, was then also an enemy to Richard, on account of his having married Berengaria, the daughter of Tancred king of Sicily. He, therefore, offered a large sum of money to Leopold to deliver his captive up to him. Meantime England was in great confusion. Richard had left it under the direction of Hugh bishop of Durham, and Longchamp bishop of Ely. The tempers of these prelates being very different,

great animosity arose between them. Longchamp at last arrested his colleague, and obliged him to resign his power. The king, by many letters, commanded Longchamp to replace his coadjutor, but to no purpose. When the situation of the king became uncertain, Longchamp tyrannised to such a degree, that John, the king's brother, thought proper to oppose him. He then left the kingdom; and upon this the archbishop of Rouen was made justiciary in his room. The king of France, informed of these dissensions, strove to increase them as much as possible; and had even almost prevailed upon John to throw off his allegiance, by promising to put him in possession of all Richard's continental dominions. But when the English received the news of Richard's captivity, a general indignation was excited against his enemies, among whom the greatest and most artful was his own brother John. On the very first invitation from the court of France, he went abroad, and held a consultation with Philip, the object of which was the perpetual captivity of his brother. He promised to deliver into Philip's hands a great part of Normandy; and, in return, he received the investiture of all Richard's transmarine dominions: it is even said, that he did homage to the French king for the crown of England. In consequence of this treaty, Philip invaded Normandy, and made considerable progress in the conquest of it. He was, however, at last repulsed by the earl of Leicester, who was now returned from the Holy Land, and a truce was concluded on condition of the French king receiving 20,000 merks, and the English putting four castles into his hands as security for the payment.

John, who had come over to England, met with still less success in his enterprises. He was only able to make himself master of the castles of Windsor and Wallingford; but when he came to London, and demanded the kingdom as heir to his brother, of whose death he pretended to have received certain intelligence, he was rejected by all the barons, and measures were taken to oppose and subdue him. The defence of the kingdom was so well provided for, that John, after some fruitless efforts, was obliged to conclude a truce with his opponents; and, before the termination of it, he thought proper to retire to France, where he openly acknowledged his alliance with Philip. At last the efforts of Richard's enemies proved ineffectual to detain him in captivity. He was brought before the diet of the empire at Worms, where the emperor Henry charged him with many crimes and misdemeanors; but the king replied with so much spirit and eloquence, that the German princes exclaimed loudly against the conduct of the emperor; the pope threatened him with excommunication; and Henry, who had hearkened to the proposals of the king of France and prince John, found that it would be impossible for him to execute their base purposes, or detain the king of England any longer. He therefore concluded a treaty with him for his ransom, at the price of 150,000 merks (about £300,000 of our money), of which 100,000 merks were to be paid immediately, and sixty-seven hostages delivered for the remainder. The money for the king's ransom was most cheerfully raised by the English and the churchmen were in this instance most liberal to their sovereign. The churches and monasteries melted down their plate to the amount of 30,000 merks; the bishops, abbots, and monks, paid a fourth part of their yearly rent; the parochial clergy contributed a tenth part of their tithes; and, the requisite sum being collected, queen Eleanor and Walter archbishop of Rouen set out with it for Germany—paid the money to the emperor and duke of Austria, at Mentz—and, delivering them hostages for the remainder, freed Richard from his captivity. His escape was very critical. Henry had been detected in the assassination of the bishop of Liege, and in an attempt of the same nature on the duke of Louvaine; and finding himself extremely obnoxious to the German princes, on account of these practices, he had determined to seek the alliance of the French king, and to detain Richard in prison notwithstanding the sum he had received. He therefore gave orders that the king of England should be pursued and arrested; but he had, happily, already embarked at the mouth of the Scheldt, and was out of sight of land when the emperor's messengers reached Antwerp. The king of France no sooner heard of Richard's deliverance than he wrote to John, his confederate: 'Take care of yourself: the devil is broke loose.'

King Richard returned from captivity on the 20th of March 1194, and was received with the utmost joy by his subjects. He had been but one day landed, when his treacherous brother John came to make his submission. At the intercession of queen Eleanor he was received into favor. 'I forgive him,' said the king, 'and hope I shall as easily forget his offences as he will my pardon.' Richard was impatient to revenge himself on the king of France, and therefore instantly made war upon him. But, though both kings were inflamed with the most violent resentment, they found it impossible to engage their powerful barons heartily in their cause. The war, therefore, produced no remarkable event; and, in 1195, was concluded by a truce for five years. On some slight occasion it was ready to break out anew, when the pope's legate interposed, and a treaty was about to be concluded. King Richard, in the mean time, was wounded by an arrow at the siege of Chalus, a castle of Limoges. The wound was not in itself dangerous; but, being unskilfully treated, a mortification ensued, and the king expired on the 9th April 1199, in the tenth year of his reign and forty-second of his age. By his will he left the kingdom to his brother John, but distributed a fourth part of his treasure among his servants.

John succeeded to the crown of England without opposition, but soon found his affairs embarrassed on the continent. The king of France, who, during the life of Richard, had always supported the pretensions of his brother, now afforded similar support to the claims of prince Arthur, the son of Geoffrey, then about twelve years of age. There was in this, however, so evident a regard to his own interest, that Constantia, the mother of the young prince, submitted herself and her son at once to John,

who detained them in Mans. The new king was weak, tyrannical, cruel, and treacherous. He is represented as exhibiting almost every bad quality of a prince; and his conduct soon rendered him universally odious. Imagining himself secure on the side of France, he indulged his passion for Isabella, the daughter and heiress of the count of Angouleme, although his queen, the heiress of the family of Gloucester, was still living, and Isabella was contracted to the count de la Marche. John persuaded the count de Angouleme to carry off his daughter from her husband, at the same time that he procured a divorce from the queen. Thus he at once incurred the displeasure of the pope, and of the count de la Marche, and a powerful confederacy was formed against him. John had neither courage nor policy sufficient to keep his barons in awe: he now, therefore, hired a number of ruffians, whom he called his champions, to fight duels with them on the slightest pretences: but they in general declined to meet their opponents, as far below their rank, and dangerous combinations were formed against the king's authority. The murder of prince Arthur rendered John still more generally detested. The young prince with his mother had fled to the court of France, where they were received with the greatest kindness, and he enterprises of the French forces on their behalf were attended with considerable success; when Arthur himself had the misfortune to be taken prisoner: all the other captives were sent to England, but the prince was shut up in the castle of Falaise, and from that time was never heard of. It was universally believed that John had murdered him with his own hand; and this inflamed the general resentment against him to such a degree, that he soon after lost all his French provinces. In 1205 the duchy of Normandy itself was conquered by Philip, and John was forced to fly with disgrace to England. The king now resolved to wreak his vengeance upon the barons, who, he pretended, had deserted his standard in Normandy. For this reason he levied large sums on their estates, in order, as he said, to undertake an expedition to the continent. This expedition, however, he several times capriciously deferred; and, having once ventured out to sea, returned again without making the smallest attempt. At last he landed at Rochelle, and burnt the city of Angiers; but, hearing that the enemy were preparing to oppose him, he returned without attempting any thing further. Such irresolute and cowardly behaviour increased the disgust of all ranks of his English subjects; but the Norman princes had so far extended the prerogatives of the crown, that the barons, however discontented, durst not yet attempt to change the form of government. By entering into controversy with the church John completed his ruin. The clergy, who had for some time acted independently of the crown, and obtained in general a confirmation from the pope of their elections of each other, were still not unanimous among themselves. The election of the archbishops had been a subject of continual dispute between the suffragan bishops and the Augustine monks. At this time the see of Canterbury became vacant, and the Augustine monks, in a private manner, elected Reginald, their superior, to this high office. The bishops in vain exclaimed against the election, as a manifest innovation of their privileges: a furious theological contest was the only result: but John now very imprudently espoused the cause of the suffragan bishops; in consequence of which De Grey, bishop of Norwich, was also chosen archbishop of Canterbury. The cause was appealed to Rome; and pope Innocent III., seizing with avidity an opportunity of extending his power, commanded the monks to choose a third archbishop, in the person of cardinal Stephen Langton, an Englishman, then at the court of Rome. The power of nominating an archbishop of Canterbury (a person at this period of almost equal authority with the king) was an acquisition to the papal authority not to be slighted. John, however, was resolved not to submit to this; but he had not judgment sufficient to conduct his opposition. He violently expelled the monks from their convents, and seized upon their revenues. The pope threatened in return to put the whole kingdom under an interdict. The prelates therefore now threw themselves on their knees before the king, and in the most earnest manner entreated him to avoid the resentment of the holy tribunal, by receiving the primate of the pope, and restoring the monks to their convents. John, on this, broke out into the most violent invectives. He swore by God's teeth (his usual oath), that if the kingdom was put under an interdict he would banish the whole body of the clergy, and confiscate all their possessions. The pope at last, finding he might do it with safety, issued forth his threatened sentence. The consequences that ensued are at this period of the world almost incredible. A stop was immediately put to divine service; and the administration of all the sacraments, except baptism. Throughout England the church doors were shut, and the images of the saints laid on the ground. The dead were refused Christian burial, and were thrown into ditches and on the highways; while marriage was celebrated in the church-yards, and the people prohibited the use of meat and their ordinary amusements, as in times of public penance. The clergy affected to deplore the unhappy state of the nation, of which they were so largely the cause; while John, in revenge, imprisoned all their concubines, and treated the adherents of Langton with the utmost rigor. His furious and misguided efforts proved, however, totally ineffectual. He had scarcely a friend in the whole nation; and in 1209, therefore, the pope denounced a sentence of personal excommunication against him. This was soon followed by another, absolving all his subjects from their allegiance, and declaring every one to be excommunicated who had any commerce with him at his table, council, or even in private conversation. The king, exasperated by these indignities, wreaked his vengeance on his unhappy subjects, whose affections he ought rather to have attempted to conciliate. The pope, therefore, further proceeded to execute the full measure of his wrath on this prince, by bestowing his kingdom on Philip of France. He

even published a crusade all over Europe against the king of England, exhorting the nobility, knights, and men of every condition to take up arms against him as an usurper, and to enlist under the French banner. Philip was not less active on his part: he summoned all the vassals of the crown to attend him at Rouen; and having collected a fleet of 1700 vessels, was ready, in 1213, to invade England. But the pope had now in his turn overstretched his power; and had the nation been governed by a prince of any common prudence or resolution, the domineering influence of the clergy would have been for ever broken. The people, however superstitious, were not disposed to submit tamely to be given away by the pope from one master to another, and this, added to the natural antipathy subsisting between the French and English, brought around John, in spite of his previous tyranny, an army of 60,000 men. But the pope was too good a politician to suffer matters to be carried to extremities. He promised himself more advantages from the submission of John than from an alliance with Philip; and therefore sent over his legate to England, under pretence of conferring with the barons, but in reality to hold a conference with the English monarch. He represented to this forlorn prince the numbers of the enemy, the hatred of his own subjects, and the secret confederacy there was every where against him; intimating that there was but one way to secure himself from the impending danger—namely, to put himself under the protection of the pope, who was a merciful father, and ever willing to receive a penitent. The abject and irresolute spirit of John submitted to this piece of arrogance: he took an oath to obey whatever the pope should command; and in consequence of this added another, the most extraordinary perhaps in the annals of history. It was expressed in the following words: 'I, John, by the grace of God king of England, and lord of Ireland, in order to expiate my sins, from my own free will, and the advice of my barons, give to the church of Rome, to pope Innocent, and his successors, the kingdom of England, and all other prerogatives in my crown. I will hereafter hold them as the pope's vassal. I will be faithful to God, to the church of Rome, to the pope my master, and his successors legitimately elected. I promise to pay him a tribute of 1000 merks; to wit, 700 for the kingdom of England, and 300 for the kingdom of Ireland.' This oath was taken by the king before all the people kneeling, and with his hands held up between those of the legate. Having then agreed to re-instate Langton in the primacy, he received the crown, which he had been supposed to have forfeited; while the legate, to add to his former insolence, trampled under his feet the tribute which John had consented to pay. The king of France, enraged at this behaviour of the pope, now resolved to execute his project of conquering England, in spite of him and all his censures. His fleet, however, was attacked in their harbours by the English, who took 300 vessels, and destroyed about 100 more; while Philip, finding it impossible to prevent the rest from falling into the hands of the enemy, set fire to them himself, and was thus obliged to give up all hopes of success.

John, thus freed from immediate danger, recommenced the cruel and tyrannical measures which had before rendered him odious to his subjects. His scandalous subjection to the clergy now gave the barons an opportunity of exerting themselves to reduce the enormous prerogatives of the crown. Their designs were also facilitated by the concurrence of Langton, the primate, who seems to have shown a sincere and remarkable regard for the interests of the kingdom. At a synod of his prelates and clergy, convened in St. Paul's, on pretence of examining into the losses of some bishops who had been exiled by John, he privately conferred with a number of barons, to whom he expatiated upon the vice and injustice of their prince. He showed them a copy of Henry the First's charter, the only one in the kingdom, which had been buried in the rubbish of an obscure monastery, and exhorted the barons to insist on a renewal of it. This they solemnly swore to do. The same agreement was afterwards renewed at a more numerous meeting of barons summoned by Langton at St. Edmondsbury. Here it was resolved, that at Christmas they would prefer their common petition in a body; and in the mean time they separated with a design to put themselves in a posture of defence, and enlist men. In the beginning of January, 1215, they repaired to London, accoutred in their military garb and equipage, and presented their petition to the king, alleging that he had promised to grant a confirmation of the laws of Edward the Confessor, at the time he was absolved from his excommunication. John resented their presumption; and required a promise under their hands and seals, that they would never demand, or attempt to extort, such privileges for the future. This they refused with such unanimity and resolution, that the king desired time to consider their demands. He promised, that, at the festival of Easter, he would give a positive answer to their petition; and offered them the archbishop of Canterbury, the bishop of Ely, and the earl mareschal, as sureties for fulfilling his engagements. The barons accepted of his securities, and departed peaceably; but John had no design of complying with their desires. He had recourse to the clergy, whose power he had seen and felt in so many instances, and basely courted their favor, by granting them a charter, establishing those rights of which they were already in the possession. To ingratiate himself still farther with this body, he took the cross, and appealed to the pope against the usurpation of the barons. The pope wrote letters to England, reproaching the primate and bishops with favoring these dissensions; and commanded them to promote peace between the parties. He exhorted the barons to conciliate the king, not with menaces, but with humble entreaties; and promised, upon their obedience, to interpose his own authority in favor of such of their petitions as he should find to be just. At the same time he annulled their association, and forbade them to enter into any confederacy for the future. To these remon-

strances the barons paid no regard, knowing that the fulminations of the court of Rome would be of little avail, unless they were seconded by the clergy. After waiting till Easter, when the king promised to return them an answer, they met by agreement at Stamford. Here they assembled a force of above 2000 knights, and a prodigious number of foot soldiers, and then marched to Brackley, about fifteen miles from Oxford, where the court then resided. John, on hearing of their approach, sent the archbishop of Canterbury, the earl of Pembroke, and others of his council, to know the particulars of their application. The barons delivered a schedule containing the chief articles of their demands, founded on the charters of Henry and Edward; but which were in the highest degree displeasing to the king. He burst into a furious passion, asked the barons why they did not also demand his kingdom, and swore that he would never comply with such exorbitant requisitions. The confederates then chose Robert Fitzwalter for their general; whom they dignified with the title of 'Mareschal of the army of God and of the holy church.' They laid siege to Northampton, took Bedford, and were joyfully received in London. They wrote letters to all the nobility and gentry who had not yet declared in their favor, threatening their estates with devastation in case of refusal or delay. In the mean time the king was left at Odiham in Surry, attended only by seven knights. He vainly endeavoured to avert the storm by the mediation of his bishops and ministers. He appealed to Langton against the barons, not suspecting that he was engaged in the confederacy; and desired him to fulminate the church censures against those who had made war upon their lawful prince. Langton declared that he would pass no censure where he found no delinquent; but said, that much might be done, if the king would dismiss some foreign auxiliaries which he had lately brought over. Upon this, John disbanded a body of Germans and Flemings, whom he had hitherto retained in his service, and Langton refused to excommunicate a single baron. The king, being now defenceless, was obliged to comply with the demands of his subjects. A conference was accordingly appointed, and all things were adjusted for this most important treaty. The king's commissioners met the barons at a place called Runnymead, between Staines and Windsor; a spot which is yet held in reverence as that on which the standard of freedom was first erected in England. Here the king signed Magna Charta; the maxims of which continue in force to this day, and are regarded as the great bulwark of British liberty. See MAGNA CHARTA.

This charter, however, at the time that it was made, secured liberty to the clergy, barons, and gentlemen, much more than to the bulk of the people, who did not for a long time obtain any privileges of importance. Freedom of elections was secured to the clergy; and it was determined, that fines on them for any offence, should be laid on in proportion to the estates, and not the value of their benefices. The privileges secured to the barons were, either abatements in the rigor of the feudal laws, or relief from arbitrary and ambiguous decisions before the courts. It was also decreed, that barons should recover the lands of their vassals, even though forfeited by felony, after having been in possession of the crown for a year and a day; and no tax was to be imposed without consent of the great council of the nation, excepting in case of the captivity of the king, the knighting of his eldest son, or marrying his eldest daughter. No land belonging to any baron was to be seized for a crown debt, unless the possessor had not personal property enough to pay it; neither was any vassal to be allowed to sell so much of his land as to incapacitate him from performing the necessary service to his lord. It was also determined that, when the great council of the nation was called, the prelates, earls, and barons, should be summoned by a particular writ, and the lesser barons should receive a summons from the sheriff. In favor of the people it was stipulated, that they should have from the barons all the immunities and privileges granted by the king to the former. Merchants were to be allowed to carry on their business without any arbitrary tolls or impositions, and to go out of the kingdom and return at pleasure. The goods of every freeman were to be disposed of according to his will; or, if he died intestate, the nearest heir should succeed him. No carts, horses, or wood, were to be taken by the crown officers without the consent of the owner. The king's courts were to be stationary, and no delay to be made in doing justice to every one; no freeman should be taken or imprisoned, dispossessed of his free tenement, outlawed, or banished, unless by the legal judgment of his peers, &c. It was likewise stipulated, that London should remain in the hands of the barons, and the tower be consigned to the primate, till the 15th of August following; or till the articles of the charter should be fulfilled. To give the more security for this, the king allowed them to choose twenty-five of their own number, to whose authority no limits were set either in extent or duration. If any complaint were made of a violation of the charter, either by the king or his officers, any four of the barons might admonish the king to redress the grievance; and, if satisfaction were not obtained, they might assemble the whole council of twenty-five; and they, in conjunction with the great council, were empowered to compel him to fulfil the charter. In case of his resistance, they had liberty to levy war against him, attack his castles, and use every kind of violence, except against his person, or those of the queen or children. All men throughout the kingdom were bound, under the penalty of confiscation, to swear obedience to the twenty-five barons; and the freeholders of each county were to choose twelve knights, whose business it was to report such evil customs as ought to be redressed in terms of Magna Charta. But although John had thus obliged himself by writing, to allow liberty to his subjects, he had no disposition to suffer them to enjoy it. The sense of subjection to his own vassals sunk deep in his mind. He became sullen, silent, and reserved. He shunned the society of his former friends; and retired to the Isle of Wight, as if

to hide his disgrace in solitude; but, in reality, to meditate revenge against his enemies. He now, therefore, sent to the continent to enlist a great body of mercenary troops, and made complaints to the pope of the conduct of the barons. The pontiff is said warmly to have espoused his cause; a bull was sent over, annulling the whole charter; at the same time the foreign troops arriving, the king once more found himself in a condition to demand his own terms from his subjects. The barons had made no preparations for war, not suspecting the introduction of a foreign enemy. The king, therefore, was for some time undisputed master of the field, and the most horrid cruelties were committed by his army. The nobility, who had been most active in procuring the great charter, fled with their families to Scotland, where they obtained the protection of king Alexander II. by doing homage to him. The barons, being totally unable to raise an army capable of contending with that of John, applied to their old enemy Philip of France, offering to acknowledge his eldest son Louis for their sovereign, on condition of his protecting them from the fury of John and his mercenaries. This proposal the French king accepted with joy; and, twenty-five hostages which he demanded being sent over, began to make the most diligent preparations for an expedition, regardless of the menaces of the pope. The first troops who came to the assistance of the barons, were only a body of 7000 men; but, soon after, Louis, with a powerful army landed at Sandwich. The effect of this invasion was, that most of John's foreign troops deserted, refusing to serve against the heir of their monarchy. Many considerable noblemen also left his cause, and Louis daily gained ground. He advanced to London, where the barons and burghers did him homage, and took the oath of allegiance, after he had sworn to confirm the liberties and privileges of the people. His imprudence, however, in preferring on all occasions his French to his English subjects, soon excited jealousies, and proved very prejudicial to his cause. These were greatly increased by the confession of the count de Melun, one of his courtiers, who declared on his death-bed, that it was Louis's design to exterminate the English barons as traitors, and to bestow their dignities and estates upon the French nobles who had accompanied him. A considerable desertion took place among Louis's party; so that John once more found himself in a condition to make an effort for the crown. He resolved to penetrate into the heart of the kingdom; and, for this purpose, departed from Lynn, and took the road towards Lincolnshire at the head of a great body of troops. He became entangled, however, in the marshy districts of that singular part of the country: his road was described as lying along the shore, but the period of its being regularly overflowed by the tide, was either through design or negligence concealed from him, and he lost all his carriages, treasure, and baggage by the influx of the sea. He himself escaped with the utmost difficulty, and arrived at the abbey of Swineshead, where his grief for the loss he had sustained, and the distracted state of his affairs, threw him into a fever, which soon appeared to be attended with fatal symptoms. He died at Newark in the year 1216, the fifty-first of his age, and eighteenth of his reign, leaving two legitimate sons: Henry, who succeeded him on the throne, and was about nine years of age; and Richard, who was about seven. He left also three daughters; Jane, married to Alexander II. king of Scotland; Eleanor, countess of Pembroke; and Isabella, married to the emperor Frederic II.

The earl of Pembroke when John died was mareschal of England, and at the head of the army; in times of such turbulence, of consequence, he was regarded as at the head of the state. Having continued faithful to his late father-in-law in his greatest reverses of fortune, he now determined to support the authority of the infant prince Henry; and carried him, therefore, immediately to Gloucester, where the ceremony of his coronation was performed by the bishops of Bath and Winchester, in the presence of Gualo the papal legate, and as many of the nobles as could be assembled.

The young prince was obliged to swear fealty to the pope, and renew the homage which his father had done for the kingdom; after which the earl of Pembroke was chosen protector. Till he arrived at years of maturity, the transactions of Henry III's reign therefore can only be considered as those of his tutors. Pembroke, a nobleman, it appears, of unspotted honor and integrity, caused him to grant a new charter of liberties, consisting of the concessions extorted from John, with some alterations; and the next year it was renewed, with additional articles. Thus these famous charters embodied the substance of most of our present legal maxims; and they were, during many generations, esteemed the ramparts of national liberty and independence. Securing the rights of all orders of men, they were anxiously defended by all, and became the basis of the English constitution; a kind of contract, which both limited the authority of the king, and ensured the conditional allegiance of his subjects. If often violated, they were still re-claimed and re-enforced by the nobility and the people; and, as no precedents were supposed valid that infringed them, they rather acquired, than lost authority, from the frequent attempts to subvert them. These charters were wisely made use of by Pembroke as arguments to draw off the malecontent barons from their allegiance to Louis. He insisted that, whatever jealousy they might have entertained against the late king, a young prince, the lineal heir of their ancient monarchs, had now succeeded to the throne, without inheriting either the resentments or the principles of his predecessor: That the desperate expedient, which they had employed, of calling in a foreign potentate, had, happily for them, as well as for the nation, failed of success; and it was still in their power, by a quick return to their duty, to restore the independence of the kingdom, and secure that liberty for which they so zealously contended: that, as all past offences of the barons were now buried in oblivion, they ought, on their part, to forget their complaints against their late sovereign; who, if he had been

anywise blameable in his conduct, had left to his son the salutary warning to avoid his paths: And that, having now obtained a charter for their liberties, it was their interest to show, by their conduct, that that acquisition was not incompatible with their allegiance; and that the rights of the king and people, so far from being hostile and opposite, might mutually support and sustain each other. These considerations, enforced by Pembroke's known character of constancy and fidelity, had a very great influence on the barons. Most of them began to negociate with him, and many actually returned to their duty. Meantime Louis continued to disgust those of his own party by the preference which he visibly gave to the French. Though he went over to France, therefore, and brought fresh succours, he found that his influence was much weaker than before, by the desertion of his English confederates; and that the death of John had, contrary to his expectations, occasioned the total ruin of his affairs. In a short time Pembroke was so much strengthened by deserters from Louis's party, that he ventured to invest Mount Sorrel; though, upon the approach of the count de Perche with the French army, he desisted from that enterprise. The French general immediately marched to Lincoln; and, being admitted into the town, laid siege to the castle, and soon reduced it to extremity. Pembroke summoned his forces from every quarter, in order to relieve this important place; and appeared so much superior to the French, that they shut themselves up within the city. But the garrison of the castle, having received a strong reinforcement, made a vigorous sally upon them, while the English army assaulted them from without. The French were totally routed; the count de Perche with only two persons more were killed; but many of the chief commanders, and about 400 knights, were made prisoners. On the news of this event, Louis raised the siege of Dover, and retired to London; where he received intelligence of a new disaster, which at once put an end to his hopes. A French fleet, which carried a strong reinforcement, had appeared on the coast of Kent; where they were attacked and repulsed with considerable loss, by Philip D'Albiney. He is said to have gained the victory by the following stratagem. Having got the wind of the French, he came down upon them with violence; and, throwing in their faces a great quantity of quicklime, which he purposely carried on board, they were so blinded as to be disabled from defending themselves. This misfortune urged the barons who yet adhered to Louis, to make their immediate submission to Pembroke; and Louis himself, finding his affairs desperate, was glad to make his escape home. He therefore concluded a peace with the Protector, and promised to evacuate the kingdom; only stipulating, in return, an indemnity to his adherents, and a restitution of their honors and fortunes.

The king, on arriving at his majority, was found much less fitted to govern the English than his education might have taught them to anticipate. Though his temper was mild and humane, he was very weak, fickle, and irresolute. His subjects were disgusted by the caresses he bestowed on foreigners; and this feeling rose to such a height, that the barons refused to assemble in the general council at his desire. When commanded to do so, they sent a message to Henry desiring him to dismiss his foreign advisers; otherwise they would drive both him and them out of the kingdom. Nothing, however, of great moment occurred till 1255, when the pope involved this young monarch in a scheme for the conquest of Naples, which for many years was productive of great expense and trouble, as well as disgrace to the nation. The court of Rome had reduced the kingdom of Sicily to the same state of feudal vassalage which she affected to exercise over England; but Mainfroy, a usurper, under pretence of governing the kingdom for the lawful heir, had seized the crown, and was resolved to resist the pope's authority. The latter therefore, finding that his own force alone was not sufficient to maintain his ascendancy, first had recourse to Richard, earl of Cornwall, the king's brother, who was considered the richest prince in Christendom. To him the pope offered the kingdom of Sicily, upon the sole condition of his conquering it from the usurper. Richard being too wise or too irresolute to accept this offer, the pope next applied to Henry, and offered him the crown of Sicily for his second son Edmund. Dazzled by the proposal, and without either reflecting on the consequences, or consulting his brother or the parliament, Henry gave the pope unlimited credit to expend whatever sums he thought necessary for the conquest of Sicily: and his holiness of course was not backward in exerting this privilege. He now also, in aid of it, asserted his apostolical authority to the utmost, in extorting money from the English. A crusade was published, requiring every one who had taken the cross against the infidels, or even vowed to advance money for that purpose, to support the war against Mainfroy, whom the pope accused of being a more terrible enemy to the Christian faith than any Saracen. A tenth on all the ecclesiastical benefices in England was levied for three years; and orders were given to excommunicate the bishops who did not make punctual payment. A grant was made to the king of the goods of intestate clergymen, as well as of the revenues of vacant benefices and of non-residents. These taxations, however grievous, were submitted to with little murmuring; but another suggested by the bishop of Hereford excited the most violent clamors. This prelate, who at that time resided at Rome, drew bills on all the abbots and bishops of the kingdom, to the amount of no less than 150,540 merks, which he granted to Italian merchants in consideration of the money they had advanced for the support of the Sicilian war. As it was apprehended that the English clergy would not easily submit to such an extraordinary demand, a commission was given to Rustand, the pope's legate, to use his authority. An assembly of the prelates and abbots was accordingly summoned; who, on hearing the state of affairs, and the amount drawn on them by the united papal and regal authority, were struck with the utmost surprise and indignation. A violent altercation took place; during which the legate told them, that all ecclesiastical

benefices were the property of the pope, and that he might dispose of them as he pleased. The affair ended, however, in the submission of the clergy; but the barons still continued refractory, and for some time answered the king's demands of supplies with expostulations; urging his partiality to foreigners, and the various injuries the nation had sustained from the servants of his crown. The great council of the nation, which had lately obtained the name of parliament, was therefore dissolved, and another called, but with as little success as before. The king, however, had involved himself in so much debt, that a large supply was absolutely necessary; and, as this could not be obtained from parliament, he was now reduced to the humiliating expedient of making a personal application to such of his subjects as he thought most attached to him. At length the barons, perceiving his exigencies, seemed willing to afford him relief; and, upon his promising to grant them a plenary redress of grievances, a very liberal supply was obtained, and he renewed their charters with more than usual solemnity. All the prelates and abbots were assembled with burning tapers in their hands; Magna Charta was read in their presence; and they denounced sentence of excommunication upon all who should infringe upon its decisions. They then extinguished their tapers on the ground, exclaiming, 'May every soul that proves false to this agreement so consume and corrupt in hell.' The king subjoined, 'So help me God, I will inviolably keep all these things, as I am a man, as I am a Christian, as I am a knight, and as I am a king crowned and anointed.' No sooner, however, had Henry received the supplies promised, than he forgot this solemn engagement, again put his confidence entirely in foreign counsellors, and evaded or broke through all the charters he had given. This conduct rendered him so obnoxious to the barons, that Simon Mountfort, earl of Leicester, a man of a violent and ambitious temper, determined to attempt an innovation in the government. He formed a powerful confederacy against the king, and the designs of the conspirators were so effectually matured, that, in 1258, when Henry had summoned a parliament in expectation of receiving supplies for his Sicilian project, the barons appeared in the hall completely armed. The king, struck with this unusual appearance, asked them what was their purpose, and whether they intended to make him their prisoner? Roger Bigod, earl Mareschal, answered in the name of the rest, that he was not their prisoner; that they even intended to grant him large supplies, in order to fix his son on the throne of Sicily; that they only expected some return for this expense and service; and that as the king had frequently made submissions to the parliament, had acknowledged his past errors, and still allowed himself to be carried into the same path, he must now yield to more strict regulations, and confer authority on those who were able and willing to redress the public grievances. Henry instantly assured them of his intentions to grant them all possible satisfaction; and for that purpose summoned another parliament at Oxford, to digest the new plan of government, and to elect proper persons who were to be entrusted with the chief authority. This assembly, afterwards called the mad parliament, went very expeditiously to work in the business of reformation: twenty-four barons were appointed, with supreme authority, to reform abuses, and Leicester was placed at their head. Their first step was to order four knights to be chosen out of each county, who should examine into the state of their respective constituents, and should attend at the ensuing parliament to give information of their complaints. They ordained that three sessions of parliament should be regularly held every year; that a new high sheriff should be elected annually; that no wards nor castles should be entrusted to foreigners, no new forests made, nor the revenues of any counties let to farm. These constitutions were so just, that some of them remain to this day. But the parliament having thus obtained the sovereign power, took care not to part with it again. They not only protracted the time of their sitting under various pretences; but at last had the effrontery to impose an oath upon every individual of the nation, declaring an implicit obedience to all the statutes executed, or to be yet executed, by the barons who were thus appointed as rulers. They not only abridged the authority of the king, but the efficacy of parliament also; giving up to twelve persons the whole parliamentary power between each session. These usurpations were first opposed by the knights of the shire, whom they themselves had appointed, and who had for some time begun to be regularly assembled in a separate house, to consider of the national grievances. The first of them was the conduct of the twenty-four rulers. They represented that, though the king had performed all that was required of him, the barons had hitherto done nothing on their part that showed an equal regard for the people; that their own interest and power seemed the only aim of all their decrees; and they now called upon the king's eldest son, prince Edward, to interpose and save the sinking nation. The prince was at this time about twenty-two years of age, and by his active and resolute conduct had inspired the nation with great hopes. He told those who made the application to him, that he had sworn to the late constitutions; and, on that account, though they were contrary to his own private opinions, he was resolved not to infringe them. At the same time, however, he sent a message to the barons, requiring them to bring their undertaking to an end, or otherwise to expect the most vigorous resistance to their usurpations. On this the barons published a new code of laws, which, though it contained little that was material, would, it was supposed, for a while dazzle the eyes of the people, until they could take measures to strengthen their authority. In this manner, under various pretences, they continued their power for three years; until the whole nation loudly condemned their treachery, and the pope at last absolved the king and his subjects from the oath they had taken to obey them. Soon after this a parliament was called, and the king was re-instated in his former authority. For a time, at least, the barons were obliged to submit, but the earl of

Leicester having joined the Welsh, who at this time made an irruption into England, the kingdom was reduced to the most deplorable situation. The pusillanimity of the king prevented any proper or decisive method being pursued for extricating the country from its difficulties; at last, however, a treaty was concluded with the barons on the following disgraceful terms. They were restored to the sovereignty of the kingdom, took possession of all the royal castles and fortresses, and even named the officers of the king's household. On this they summoned a parliament to meet at Oxford, to settle the plan of their government; and now it was enacted, that the authority of the twenty-four barons should continue not only during the life of Henry, but also during that of prince Edward. The latter, however, utterly rejected this scheme, and a civil war immediately ensued. The prince was at first successful; but his impetuosity occasioned the loss of a battle, in which his father and uncle were taken prisoners, and he himself was obliged soon after to surrender to the ambitious earl of Leicester. After this the king was reduced to the most deplorable situation. His partisans were disarmed, while those of the earl kept themselves in an offensive posture. Leicester seized the estates of no fewer than eighteen of his own colleagues the barons; engrossed to himself the ransom of all prisoners; monopolised the sale of wool in foreign markets; and at last ordained that all power should be exercised by nine persons, who were to be chosen by three, or the majority of them; these three being the earl of Leicester himself, the earl of Gloucester, and the bishop of Chichester. At last, the miserable condition to which the king and kingdom were reduced, proved the means of settling the government on a more secure foundation. Leicester, to secure himself, was obliged to have recourse to an aid, till now entirely unknown in England, namely, that of the body of the people. He called a parliament, where, besides the barons of his own party, and several ecclesiastics who were not proper tenants of the crown, he ordered returns to be made of two knights from every shire; and also deputies from the boroughs, which had been hitherto considered as too inconsiderable to be allowed any share in the legislation.

This parliament was called on the 20th of January 1256; and in it we find the first outline of an English house of Commons; an institution which has ever since been justly considered as the bulwark of British liberty. The new parliament was far from being so compliant to Leicester as he had expected. Many of the barons who had hitherto adhered to his party, were disgusted with his boundless ambition; and the people began to wish for the re-establishment of royal authority. Leicester, at last, to make a merit of what he could not prevent, released prince Edward from his confinement, and had him introduced at Westminster hall, where his freedom was confirmed by the unanimous voice of the barons. But though Leicester had all the popularity of restoring the prince, he was yet politic enough to keep him guarded by his emissaries. At last, however, he found means to make his escape. The earl of Gloucester, disgusted with Leicester, had retired from court, and went to his estates on the borders of Wales. His antagonist pursued him, and to give the greater authority to his arms, carried the king and prince of Wales along with him. This furnished young Edward with the opportunity he had so long desired. Being furnished by the earl of Gloucester with a horse of extraordinary swiftness, he escaped from his guards, who were not able to come up with him; and the appearance of a body of troops belonging to Gloucester soon put an end to their pursuit. The prince no sooner recovered his liberty, than the royalists joined him from all quarters, and an army was soon assembled which Leicester could not withstand. This nobleman now found himself in a remote quarter of the kingdom, surrounded by his enemies and debarred from all communication with his friends by the river Severn, whose bridges Edward had broken down. In this extremity, he wrote to his son to hasten to his assistance from London, and the latter advanced to Kenilworth; but here he was surprised, and his army entirely dispersed by prince Edward. The young prince, immediately after this victory, advanced against Leicester himself; who, ignorant of the fate of his son's expedition, had passed the Severn in boats. He was by no means able to cope with the royalists, being outnumbered by them considerably, and was defeated at Evesham with great slaughter. Leicester himself, though he begged for quarter, was slain, together with his eldest son Henry, and about 160 knights and gentlemen. The old king had been purposely placed by the rebels in the front of the battle, where he was wounded and in great danger of being killed; but, crying out, 'I am Henry of Winchester your king,' he was preserved and consigned to a place of security by his son. The body of Leicester being found among the dead, was barbarously mangled and then sent to his widow. This victory proved decisive in favor of the royal party. Almost all the barons hastened to make their submissions, and opened their gates to the king. The Isles of Axholme and Ely indeed ventured to hold out, but were at last reduced, as well as the castle of Dover, by the valor of prince Edward. Baron de Gourdon, also maintained himself for a time in the forests of Hampshire, and by his depredations obliged the prince to lead a body of troops against him. Edward attacked him in his camp, and, in the ardor of action, leaped over the trench with a few followers, and encountered Gourdon himself in single combat. The victory was long disputed between them; but ended at last in the prince's favor, who wounded his antagonist, threw him from his horse, and took him prisoner. He not only granted him his life; but introduced him that very night to the queen at Guildford, procured his pardon, and was ever after faithfully served by him. In 1271 prince Edward, having settled the affairs of the kingdom, undertook an expedition to the Holy Land, where he signalised himself by many acts of valor. The king's health declined visibly after the departure

of his son; and at last, worn out with cares and the infirmities of age, he expired at St. Edmondsbury on the 16th of November, 1272, in the sixty-fourth year of his age and the fifty-sixth of his reign.

Prince Edward had reached Sicily in his return from the Holy Land, when he received an account of his father's death; at which he expressed much concern. As he knew that England was at that time in a state of perfect tranquillity, he was in no haste to return, but spent nearly a year in France before he made his appearance in his native country. Here he was received on his arrival with the utmost joy, and crowned at Westminster by Robert archbishop of Canterbury, on the 19th of August, 1274. He immediately applied himself to the correcting of those disorders which the civil commotions, and weak administration of his father, had introduced. A system of strict justice, bordering on severity, was introduced and kept up through the whole of his reign. The Jews were the only part of his subjects whom Edward oppressed. Many arbitrary taxes were levied upon them; 280 of them were hanged at once for adulterating the coin; the goods of the rest were confiscated, and all of them banished the kingdom. In 1276 the king undertook an expedition against Lewellyn prince of Wales, who had refused to do homage for his crown, but the conquest of that country was not fully accomplished till 1283; after which the principality of Wales was annexed to the crown of England, and thenceforth gave a title to the king's eldest son. See WALES. In 1286 the settlement of Wales appeared so complete, that the king went abroad in order to make peace between Alfonso III. king of Arragon, and Philip IV. of France, who had a dispute about the kingdom of Sicily. He succeeded in his negociations; but, staying abroad three years, he found that many disorders had been introduced in his absence. Robbery and murder were frequent in every part of England; but the corruption of the judges was of still more dangerous consequence. Edward summoned a parliament, and brought them to trial; when all of them except two, who were clergymen, being convicted of mal-practices, were fined, and deposed from their office. The amount of the fines levied upon them was above 100,000 merks; an immense sum in those days. The king afterwards made the new judges swear they would take no bribes; but the deposing and fining the old ones was the most effectual lesson. In 1291 king Edward began to meditate the conquest of Scotland, which employed him during the rest of his life; but which, though the attempt was productive of distress to both nations, he was never able to accomplish. See SCOTLAND. At the same time he was engaged in expensive contests with France; and these multiplied wars and preparations for war, by obliging him to have frequent recourse to parliamentary supplies, became the remote causes of great and important changes in the government. The parliament was modelled into the form which has continued ever since. As a great part of the property of the kingdom, by the introduction of commerce and improvements in agriculture, was transferred from the barons to the inferior ranks of the people, their consent became necessary for raising the supplies. The king accordingly issued writs to the sheriffs, enjoining them to send to parliament along with two knights of the shire, two deputies from each borough within their county, provided with sufficient powers from their constituents to grant such demands as they should think reasonable for the safety of the state. The charges of these deputies were to be borne by the boroughs which sent them; and so far were they at first from considering this as an honor, that nothing could be more displeasing to any borough than to be thus obliged to send a deputy, or to any individual than to be thus chosen. The authority of the commons, however, gradually increased. Their union gave them weight; and it became customary among them, in return for the supplies which they granted, to present petitions to the crown for the redress of grievances. The more the king's necessities increased, the more he found it necessary to give them an early redress; till, from requesting, the commons proceeded to demanding; and, having all the property of the nation, they began also to be possessed of the power. Edward, commonly called the I. though in reality the IV. of the name, as he is styled by Marcel, died of a dysentery at Carlisle, on the 7th of July, 1307, as he was leading a considerable army into Scotland. He was succeeded by his son Edward, whom he had charged with his dying breath to prosecute the war, and never to desist till he had finally subdued that kingdom. But the new king was of a different disposition from his father. The Scotch gradually recovered their power, and in 1314, gave the English such a terrible defeat at Bannockburn, that for many years after, no superiority of numbers could encourage them to look the Scotch in the face. See SCOTLAND.

Although Edward II. was a weak rather than an ill-meaning prince, his reign was one continued series of quarrels with his turbulent subjects. Like a man born more to be governed than to govern, he ruled throughout by certain favorites. The first of these was Piers Gaveston, the son of a Gascon knight of some distinction, who had honorably served the late king, and who, in reward for his services, had obtained an establishment for his son in the family of the prince of Wales. To be the favorite of a king is no doubt a sufficient offence to other courtiers. Numberless faults were therefore found with Gaveston by the barons. When the king went over to France to espouse the princess Isabella, to whom he had been long contracted, this minion was left guardian of the realm, with very ample powers; and when the queen, who was of an imperious and intriguing spirit, arrived, Gaveston fell under her displeasure, on account of his ascendancy over the king. A conspiracy was therefore formed against him, at the head of which were the queen, and the earl of Lancaster, the most opulent and powerful nobleman in England. Edward, unable to resist such a combination, was at last obliged to banish Gaveston but recalled him some time after, when a civil war ensued; and the nobility, having seized

Gaveston, put him to death. Edward transferred his attachment to a new favorite, Hugh le Despenser, or Spenser, a young man of a noble family, some merit, and very considerable accomplishments. His father was a person of respectable character, and being admitted to share the king's favor, Edward dispossessed some of the more turbulent lords of their estates, to bestow them upon this family. The earls of Lancaster and Hereford flew, on this, to arms. Sentence was procured from parliament of perpetual exile against the two Spensers, with a forfeiture of all their estates. At last the king took the field at the head of 30,000 men, and pressed the earl of Lancaster so closely, that he had not time to collect his forces; flying from one place to another, he was at last stopped on his way towards Scotland, and made prisoner. A court martial being summoned, he was immediately condemned as a traitor, and executed on an eminence near Pomfret, with circumstances of the greatest indignity. The Spensers now triumphed for some time over their enemies; most of the forfeitures were seized for their use, and they are said to have been guilty of many acts of rapine and injustice. But a more formidable enemy to them soon avowed herself. Queen Isabella fled to France, and refused to return to England till Spenser was removed from the court, and banished the kingdom. She was at this time carrying on a criminal intrigue with a young noble named Mortimer. Her court therefore became a sanctuary for all the malecontents who were banished, or who chose to come over; and her opposition to the Spensers made her popular in England. When she thought her plans sufficiently matured, she set sail from Dort, accompanied by a force of 3000 men. Landing without opposition on the coast of Suffolk, on the 24th of September, 1326, the people rose in one general revolt in her favor. The unfortunate king had placed some dependence on the garrison of Bristol, which was under the command of the elder Spenser; but they mutinied against their governor, and that unfortunate favorite, being delivered up, was hanged on a gibbet in his armour; his body was afterwards cut in pieces and thrown to the dogs, and his head exhibited on a pole in Winchester. Young Spenser did not long survive his father. He was taken, with some others who had followed the fortunes of the wretched king, in an obscure convent in Wales. The queen ordered him to be immediately led forth, and he was executed, amidst the insults of herself and the populace, on a gibbet fifty feet high. His head was transmitted to London, where it was received by the citizens with brutal triumph, and fixed on the bridge. In the mean time the king, who hoped to find refuge in Wales, was delivered up to his adversaries, who conducted him to the capital amidst the reproaches of the people, and confined him in the Tower. Charges were soon exhibited against him to the parliament, alleging his incapacity to govern, his indolence, his love of pleasure, and his being swayed by evil counsellors. His deposition was quickly voted, and, a pension being assigned for his support, his son Edward, a youth of fourteen, was chosen to succeed him. The queen was appointed regent during the minority. After this, we find the deposed monarch consigned successively to the custody of the earl of Lancaster, and the lords Berkeley, Mautravers, and Gournay, who were entrusted with the charge of him each for a month. While he was in Berkeley's custody, he was used with some degree of humanity; but under Mautravers and Gournay, every species of indignity was practised upon him. One day, it is said, when Edward was to be shaved, they ordered cold and dirty water to be brought from a ditch for that purpose. Taking advantage, finally, of lord Berkeley's sickness, which prevented him from attending the king, they came to Berkeley Castle and took possession of the king's person. One night, while they had him in charge, the inmates of the castle heard the most horrid shrieks, proceeding from his apartment. The next morning his dead body was exhibited, and the citizens of Bristol were called in to witness that it showed no external marks of violence. But the features of the countenance were dreadfully distorted; and these wretches were, at the time, reported to have despatched him by thrusting a red-hot iron up his body. When the ensuing revolution deprived their protectors of power, they fled the kingdom. Gournay was at last seized at Marseilles, delivered over to the seneschal of Guienne, and put on board a ship with a view of carrying him over to England; but he was beheaded at sea, by secret orders, as was supposed, of some nobles and prelates in England, who were anxious to prevent any discovery which he might make of his accomplices. Mautravers concealed himself for some years in Germany; but having rendered some services to Edward III. he ventured to approach his person, threw himself on his knees before him, and received a pardon. Mortimer, it is said, confessed, before his death, that he instigated, and Gournay and one Ogle actually committed, this murder.

By the murder of Edward II. the government fell entirely into the hands of the queen and her paramour. The parliament, which raised young Edward to the throne, had indeed appointed twelve persons as his privy council, to direct the operations of government; Mortimer excluding himself under a show of moderation: but he at the same time secretly influenced all the measures that came under deliberation. As this influence began very soon to be perceived, and the queen's criminal attachment to Mortimer was universally known, both quickly became obnoxious to the people. The first attack upon Mortimer's power was during an irruption of the Scotch, when the favorite prevented the young king from attacking the enemy. Though it is very probable that the English army would have been destroyed, by attacking the enemy in so advantageous a post as the Scotch at that time occupied, Mortimer was accused of having allowed the Scotch to make their escape: and the general disgust on this account was increased by his concluding a peace with that kingdom, by which the English renounced all title to the sovereignty of Scotland for the sum of 30,000 merks. Mortimer soon after seized and executed the earl of

Kent, brother to Edward II., who, supposing him to be still alive, had formed a design of re-instating him. The execution was so sudden, that the young king had not time to interpose in his uncle's behalf; and Mortimer soon after seized this nobleman's estate for his own use, as he did also the immense fortunes of the Spensers. Edward, finding the power of this favorite a continual restraint upon himself, resolved to shake it off. The queen and Mortimer had for some time chosen the castle of Nottingham for their residence. It was strictly guarded, and the keys of the gates were carried every night to the queen. It was therefore agreed between the king and some of the barons, who secretly entered into his designs, to seize upon them in this fortress. Sir William Eland the governor was induced to admit them through a subterraneous passage, which had been formerly contrived for an outlet, but was known only to one or two. Through this passage the noblemen in the king's interest entered the castle in the night-time; and Mortimer, without having it in his power to make any resistance, was seized in an apartment adjoining to that of the queen. The parliament, which was then sitting, condemned him, without either permitting him to make his defence, or examining a single witness. He was hanged on a gibbet at a place called Elmes, about a mile from London. A similar sentence was passed against some of his adherents, particularly Gournay and Mautravers, who escaped as above-mentioned. The queen, who was perhaps the most culpable of the whole, was screened by the dignity of her station. She was, however, deposed from all share of power; and confined for life to the castle of Risings, with a pension of £3000 a year. She lived twenty-five years after her deposition, the king paying her an annual visit of ceremony. Edward III. proved the most warlike, and one of the most successful, princes that ever sat on the English throne. He first attempted to raise Edward Baliol to the sovereignty of Scotland; but this he found impossible fully to accomplish. He next formed a project of invading and conquering France, to the sovereignty of which he pretended a right. So little success attended his first operations that, on his return to England, he found the nation very much discontented, and himself harassed by his numerous creditors, without any sufficient resource for paying them. Not dispirited, however, though disappointed, he endeavoured to divert the minds of his people from the past, by various acts of arbitrary power. Finding the tower of London negligently guarded on his arrival, he imprisoned the constable and all his inferior officers, treating them with the greatest severity. He then fell upon the sheriffs and collectors of the revenue, whom he dismissed from their employments, and appointed an enquiry into their conduct to be made by persons, who, knowing the king's humor, were sure to find every one guilty who came before them. The keeper of the privy seal, the chief justice, the mayor of London, the bishops of Chichester and Litchfield, with the chancellor and treasurer, were also deposed and imprisoned. In this career of resentment and injustice, however, he found himself opposed by the archbishop of Canterbury, whom he had appointed to collect the taxes for the support of the French war. That prelate, happening to be absent at the time of the king's arrival, did not immediately feel the effects of his resentment. Being informed, however, of his humor, he issued a sentence of excommunication against all who should exercise violence against the persons or estates of clergymen, or who infringed those privileges secured by the great charter, or who should accuse a prelate of treason, or any other crime, in order to bring him under the king's displeasure. A regular combination was formed against the king by the clergy, with the primate at their head; who, to excite the indignation of the people as much as possible, reported that the king intended to recal the general pardon, and the remission of old debts, which had been granted, and to impose new and arbitrary taxes without consent of parliament. In a letter to the king, the archbishop also informed him, that there were two powers by which the world was governed, viz. the holy pontifical apostolical dignity and the regal authority; of which the clerical power was evidently the supreme, as the priests were to answer even for the conduct of kings at the last judgment; and were, besides, the spiritual fathers of all the faithful, kings and princes not excepted; having, also, a heavenly charter, entitling them to direct their wills and actions, and to censure their transgressions. On this the king resolved to mortify him, by sending no summons to him when the parliament was called: but the prelate, undaunted by this mark of resentment, appeared before the gates of the parliament-house, with his crosier in his hand, demanding admittance as the first peer of the realm. This application was rejected for two days, but at last complied with; and the parliament now seemed inclined to abridge the king's authority considerably. They began with observing, that as the great charter had been violated in many points, particularly by the illegal imprisonment of many freemen, and the seizure of their goods; it was necessary to confirm it anew, and to oblige all the chief officers of the law and others, to swear to the observance of it. It was also required that, whenever any of the great offices became vacant, the king should fill them up by the advice of his council, and the consent of such barons as should be found to be at the time in the neighbourhood of the court. They also enacted that, on the third day of every session, the king should resume all such offices into his own hand, excepting those of the justices of the two benches, and the barons of exchequer; that the ministers should for the time be reduced to private persons; that they should in that condition answer before parliament to any accusation preferred against them; and that, if they were found in any respect guilty, they should be finally deprived of their offices, and others appointed in their stead. In return for such ample concessions, the king was offered a grant of 20,000 sacks of wool; and such was his urgent necessity, that he was compelled to accept of it upon these terms. Still, however, he determined to adhere to his engagements no longer than till his difficulties were re

moved. Though the agreement, therefore, was ratified in full parliament, he secretly entered a protest, that, as soon as his convenience permitted, he would, from his own authority, revoke what had been extorted from him. This protest was afterwards confirmed by a public edict, in which he asserted, that the above statute had been made contrary to law; that it was prejudicial to the prerogatives of the crown, which he had only dissembled when he seemed to ratify it; that in his own breast he had never assented to it; and that from thenceforth it had no force or authority. This exertion of arbitrary power, which might have been expected to have ocsioned much clamor, was not taken notice of by any of the subsequent parliaments; so that in the course of two years, Edward had more than regained his entire authority, and obtained a more than virtual repeal of the obnoxious statute. Having thus settled matters to his satisfaction, the king resumed his expedition against France. In his absence the Scotch invaded England, but were entirely defeated at Durham, and their king, David II. taken prisoner. Edward, in the mean time, was obtaining a succession of victories on the continent, in which his son Edward, surnamed the Black Prince, was equally conspicuous with himself. But for the wars of Edward III. and the exploits of this prince, see CRESSY, FRANCE, and SCOTLAND.

In the first of these articles we have followed the general account of that great triumph of British valor. The following is Dr. Lingard's animated picture of the same scene:—'Never, perhaps, were preparations for battle made under circumstances so truly awful. On that very day the sun suffered a partial eclipse; birds in clouds, the precursors of a storm, flew screaming over the two armies: and the rain fell in torrents, accompanied with incessant thunder and lightning. About five in the afternoon the weather cleared up: the sun in full splendor darted his rays in the eyes of the enemy, and the Genoese setting up three shouts, discharged their quarrels. But they were no match for the English archers, who received the volley in silence, and returned their arrows in such numbers, and with such force, that the cross-bow men began to waver. The count d' Alençon, calling them cowards, ordered his men to cut down the runaways; but he only added to the disorder. Many of his knights were unhorsed by the archers, and as they lay on the ground, were dispatched by the Welshmen, who had armed themselves with long knives for that purpose. At length the passage was cleared; the count on one side, and his colleague, the earl of Flanders, on the other, skirted the English archers, while a numerous body of French, Germans, and Savoyards, forced their way to the men at arms, under the command of the prince. The second division immediately closed for his support: but the conflict grew fierce and doubtful, and Sir Thomas Norwich was sent to request a reinforcement. Edward, who, from a windmill, watched the chances of the battle, and the movements of the armies, enquired if his son were killed or wounded. The messenger replied, 'No:' 'Then,' said he, 'tell Warwick that he shall have no assistance. Let the boy wear his spurs. He and those who have him in charge, shall earn the whole glory of the day.' This answer was hailed as a prediction of victory, and infused new courage into the combatants.

'The king of France was impatient to join the count d'Alençon: but the archers in his front opposed an impenetrable barrier. At each charge he lost the bravest of his attendants; his horse had been killed under him; and his friends advised him, but in vain, to retire. At length it began to grow dark: his brother and the earl of Flanders had fallen; and the battle was evidently lost, when John of Hainault, telling him to reserve himself for victory on some other occasion, laid hold of his bridle, and led him away by force. With a small retinue of five barons, and sixty knights, he escaped to the city of Amiens. The flight of Philip did not terminate the contest. Many of the French continued in detached bodies to charge their adversaries; but as their efforts were made without concert, they generally ended in the destruction of the assailants. As the darkness increased, the fight gradually ceased; the voices of men, seeking the banners from which they had wandered, were no longer heard: and the English congratulated themselves on the repulse of the enemy. The king, ignorant of the extent of his victory, ordered fires to be kindled, and forbade his men to quit their posts. Eager to testify his approbation of the prince, he sprang to meet him, and, clasping him in his arms, exclaimed: 'Fair son, continue your career. You have behaved nobly. You have shown yourself worthy of me and the crown.' The young Edward sank on his knees, and modestly attributed all the merit to his father.

'The darkness of the night was succeeded by a dense mist in the morning, which equally intercepted the view: and to gain information, the king sent out, before sun-rise, a detachment of 3,000 men. They soon found themselves in the midst of a body of militia from Beauvais and Amiens, which, ignorant of the preceding events, had marched all night to overtake the army. These men, unsuspicious of danger, and unprepared for battle, were massacred almost without resistance. A similar mistake proved equally fatal to the archbishop of Rouen, and the grand prior of France, with a numerous body of knights. As the day cleared, thousands of Frenchmen were discovered in the fields, who had passed the night under the trees and hedges, in the hope of finding their lords in the morning. These, too, were butchered by the English cavalry, so that the carnage of the second is asserted to have exceeded that of the former day. At noon the king ordered the lords Cobham and Stafford to examine the field of battle. They took with them three heralds, to ascertain from the surcoats of the knights, and two secretaries to record, the names and rank of those who had fallen. In the evening they presented to the king eighty banners, and a catalogue of eleven princes, 1,200 knights, and 30,000 persons of inferior condition. A truce of three days was proclaimed, to allow the enemy time to bury their dead: and Edward assisted, in mourning,

at the funeral service in the cemetery of Montenay.

'Among the slain the most distinguished was John, king of Bohemia. Age had not chilled in him the fire of youth: though blind, he placed himself in the first division of the French; and as the issue grew dubious, ordered the four knights, his attendants, to lead him into the hottest of the battle, 'that I, too,' said he, 'may have a stroke at the English.' Placing himself in the midst of them, and interlacing their bridles, they spurred forward their horses, and were almost immediately slain. The reader will probably consider the Bohemian monarch as foolishly prodigal of his life. By the writers of the age his conduct has been extolled as an instance of unparalleled heroism. His crest, three ostrich feathers, with the motto, 'Ich dien,'—I serve—was adopted by the prince of Wales, and has been always borne by his successors.' The Black Prince died on the 8th of June, 1376, and the king survived only about a year. He expired on the 21st June, 1377, and was succeeded by his second son, Richard.

Richard II. being only eleven years old when he ascended the throne, the government was vested in the hands of his three uncles the dukes of Lancaster, York, and Gloucester. The different dispositions of these noblemen, it was thought, would cause them to check the designs of each other. Lancaster was neither popular nor enterprising; York was indolent and weak; and Gloucester turbulent, popular, and ambitious. Discontents first arose among the common people. They had now acquired a share of liberty sufficient to inspire them with a desire for more, and this desire was greatly increased by the discourses of one John Ball, a seditious preacher. He went about the country, teaching that mankind were all derived from one common stock; and that all of them had equal right to liberty and the goods of nature, of which they had been deprived by the ambition of a few insolent rulers. These doctrines were greedily swallowed by the populace, whose minds were farther inflamed by a new imposition of three groats a-head upon every person in the kingdom above fifteen years of age. This had been granted as a supply by parliament, and was no doubt necessary on account of the many expensive wars in which the kingdom was engaged; but its evident injustice, in laying no more burden upon the rich than the poor, excited the utmost resentment of the people. The manner, too, of collecting this tax, soon furnished them with an occasion of revolt. It began in Essex, where a report was industriously spread that the peasants were to be destroyed, their houses burned, and their farms plundered. A blacksmith, well known by the name of Wat Tyler, was the first that excited them to arms. The tax-gatherers coming to this man's house while he was at work, demanded payment for his daughter. This he refused, alleging that she was under the age mentioned in the act. One of these fellows offered to produce a very indecent proof to the contrary, and at the same time laid hold of the maid. This the father resented, by immediately knocking out the ruffian's brains with his hammer. The bystanders applauded the action; and exclaimed that it was high time for the people to take vengeance on their tyrants, and to vindicate their native liberty. The whole country flew to arms, and the insurgents soon amounted to about 100,000 men. They advanced to Blackheath, where they sent a message to the king, who had taken shelter in the tower, desiring a conference with him. Desirous of complying with their demands as far as possible, the young prince and his advisers were alike intimidated by their behaviour. But in the mean time they had entered the city, burning and plundering the houses of such as were obnoxious for their power or riches. Their animosity was particularly levelled against the lawyers, to whom they showed no mercy. The king at last, knowing that the tower was not able to resist their assaults, went out among them, and desired to know their demands. To this they made a humble remonstrance; requiring a general pardon, the abolition of slavery, freedom of commerce in the market towns, and a fixed rent instead of those services required by the tenure of villenage. The king granted all these requests; and charters were made out by which the grant was ratified. In the mean time, however, another body of the insurgents had broke into the tower, and murdered the chancellor, the primate, and the treasurer, with some other officers of distinction. They then divided themselves into different bodies, and took up their quarters in various parts of the city. At the head of one of these was Wat Tyler, who led his men into Smithfield, where he was met by the king, who invited him to a conference under pretence of hearing and redressing his grievances. Tyler ordered his companions to retire till he should give them a signal, and boldly ventured to begin a conference with the king in the midst of his retinue. His demands were, that all slaves should be set free; that all commonages should be open to the poor as well as to the rich; and that a general pardon should be passed for the late outrages. Whilst he made these demands, he now and then lifted up his sword in a menacing manner: which insolence so raised the indignation of William Walworth, lord mayor of London, that, without considering the danger to which he exposed the king, he struck down Tyler with a blow of his mace; when one of the king's knights riding up, dispatched him with his sword. The rebels, seeing their leader fall, prepared themselves to take revenge. Their bows were already bent for execution; when Richard, though not sixteen years of age, rode up to them, and with admirable presence of mind, cried out: 'What, my people, will you kill your king? Be not concerned for the loss of your leader. I myself will now be your general. Follow me into the field, and you shall have whatever you desire.' The multitude immediately desisted, and followed the king into the fields, where he granted them, by charter, the same concessions he had before made to their companions. These charters, however, were soon after revoked, and the people reduced to their old situation. The courage and address which Richard had discovered in quelling this dangerous tumult, excited great

hopes of him in the nation; but, in proportion as he advanced in years, these hopes were blasted; and his want of capacity and judgment appeared in all his undertakings. He justly forfeited the attachment of the people, by allowing the parliament to revoke the charters of enfranchisement and pardon which had been granted; and suffering their ringleaders to be put to death without any form of trial. Among his nobles, supposing himself to be in too great subjection to his uncles, particularly the duke of Gloucester, he attempted to shake off the yoke, by raising others to a greater degree of power. His first favorite Robert de Vere, earl of Oxford, a young man of agreeable person, but dissolute in his behaviour, soon acquired an absolute ascendarcy over his mind. He first created him marquis of Dublin, then duke of Ireland, transferring to him the entire sovereignty of that island by patent. He then gave him in marriage his cousin-german, the daughter of the earl of Bedford; but soon after permitted him to divorce her for another lady, of whom he became enamoured. He became eventually the dispenser of all the king's favors to such a degree, that a conspiracy was formed against him; at the head of which were, Mowbray, earl of Nottingham, Fitz-Alan, earl of Arundel, the earls of Northumberland, Salisbury, and Warwick. Vere was impeached in parliament; and though nothing of moment was even alleged against him, he was condemned, and deprived of all his offices. The royal authority itself was another object of attack. Under pretence that the king was yet unable to govern the kingdom, they appointed a commission of fourteen persons, to whom the sovereignty was to be transferred for a year. This measure was urged forward by the duke of Gloucester, and none but his own faction were admitted as members of the commission. The king at first endeavoured to gain over the parliament to his interests, by influencing the sheriffs of each county, who were then the only returning officers. This measure failing, he applied to the judges. They declared that the commission which had deprived the king of his authority was unlawful, and those who procured or advised it, were punishable with death; but their sentence was quickly opposed by declarations from the lords. The duke of Gloucester in the meantime appealed to arms: his partisans appeared at Haringay Park near Highgate, at the head of a body of men sufficient to intimidate the king and all his adherents; and began by demanding of the king the names of those who advised him to the late rash measures. A few days afterwards they appeared armed in his presence, and accused by name the archbishop of York, the duke of Ireland, the earl of Suffolk, and Sir Robert Tresilian, one of the judges who had declared in his favor, together with Sir Nicholas Bember, as public and dangerous enemies to the state. The duke of Ireland fled into Cheshire, where he attempted to raise a body of forces; but was quickly obliged to fly into Flanders, on the arrival of Gloucester with a superior army. Soon after, the king was obliged to summon a parliament, where an accusation was drawn up against five of his counsellors. Of these, only Sir Nicholas Bember was present; and he was quickly found guilty, condemned, and executed, together with Sir Robert Tresilian, who had been discovered and taken during the interval. Lord Beauchamp of Holt also was soon after condemned and executed; and Sir Simon Burley shared the same fate, though the queen continued for three hours on her knees before the duke of Gloucester, imploring his pardon. Such unparalleled insolence in a subject could not pass unpunished. In 1389, the king, at an extraordinary council of the nobility assembled after Easter, desired, to the surprise of all present, to know his age. Being told that he was upwards of two and twenty, he alleged that it was then time for him to govern without help; and that there was no reason why he should be deprived of those rights which the meanest of his subjects enjoyed. The lords answered, in some confusion, that he had certainly an undisputed right to take upon himself the government of the kingdom. 'Yes,' replied he, 'I have long been under the government of tutors; and I will now first show my right of power by their removal.' He then ordered Thomas Arundel, whom the commissioners had lately appointed chancellor, to give up the seals; which he next day delivered to William Wickham, bishop of Winchester. He next removed the duke of Gloucester, the earl of Warwick, and other lords of the opposition, from the council; and all the great officers of the household, as well as the judges. The king being thus left at liberty, rapidly advanced for some time in the affections of the people. It does not appear indeed, that he ever gave them cause of complaint; but a severe and vigorous administration was the great requisite at this period, and this demanded an energy of mind which Richard did not possess. The duke of Gloucester frequently spoke with contempt of his person and government, and suggested the lawfulness of throwing off all allegiance to so pusillanimous a prince. The king being informed of his conduct, at last formed a resolution of ridding himself of him. He ordered him to be arrested, and sent over to Calais, where there was no danger of his being rescued by his numerous adherents. The earls of Arundel and Warwick were seized at the same time; and a new parliament, which the king knew would be obedient to his will, was summoned at Westminster. Here the commission of fourteen, who had usurped the royal authority, was annulled for ever; all those acts which had condemned his former ministers were repealed; and the general pardon, which the king had given, when he assumed the government into his own hands, was revoked. Several of Gloucester's party were condemned and executed, and at last that nobleman himself was called to take his trial; but he had before been privately dispatched! After the destruction of the duke of Gloucester and the heads of his party, a misunderstanding arose among the noblemen who had joined in the prosecution. The duke of Hereford appeared in parliament, and accused his grace of Norfolk of having spoken seditious words against the king. Norfolk denied the charge, gave Hereford the lie, and offered to prove his innocence by single combat. The challenge was accepted; but on the day appointed for the duel, the king

would not suffer the combatants to engage, but commanded both of them to leave the kingdom. Norfolk he banished for life, but the duke of Hereford only for ten years. The former retired to Venice, where, in a short time he died. Hereford behaved in a resigned and submissive manner; and the king consented to shorten the time of his banishment four years: he also granted him letters patent, ensuring him of the enjoyment of any inheritance which should fall to him during his absence. Upon the death of his father, the duke of Lancaster, however, which happened shortly after, Richard revoked these letters, and kept the estate to himself. This last injury inflamed the resentment of Hereford, and he now formed the bold design of dethroning the king. He was a great favorite both with the army and people; was immensely rich, and connected by blood or alliance with all the great families of the nation. The king at the same time, it is said, gave himself up to an idle, effeminate life; and his ministers followed his example. The number of malecontents daily increased, and only waited for a favorable opportunity to put their schemes in execution: this opportunity soon offered. The earl of March, presumptive heir to the crown, having been appointed the king's lieutenant in Ireland, was slain in a skirmish with the Irish; which so incensed Richard, that, unmindful of his precarious situation at home, he went over to that country with a considerable army, in order to revenge his death. The duke of Lancaster (for this title Hereford assumed on the death of his father) hearing of the king's absence, instantly embarked at Nantz; and with a retinue of only sixty persons in three small vessels, landed at Ravenspur in Yorkshire. The earl of Northumberland, who had long been a malecontent, together with Henry Percy, his son, who, from his ardent valor, was surnamed Hotspur, immediately joined him, and the people flocked to his standard in such numbers, that in a few days he was at the head of 60,000 men. Richard, in the meantime, continued in perfect security in Ireland. Contrary winds for three weeks prevented his receiving any news of the rebellion which was begun in England. He landed therefore at Milford Haven without suspicion, attended by about 20,000 men; and immediately found himself opposed by an overwhelming force. To complete his difficulties, his army gradually deserted till he was at last obliged to compromise with the duke of Lancaster, or rather to submit to whatever terms he pleased to prescribe. The duke would not enter into any treaty with him; but carried him to London, where he was confined a close prisoner in the tower; formally deposed by parliament, or rather by the duke of Lancaster, and at last put to death. The manner of his death is variously related. According to some, eight or nine ruffians were sent to the castle of Pomfret, whither the unhappy prince had been removed, in order to dispatch him. They rushed unexpectedly into his apartment; but Richard, knowing their design, resolved to sell his life as dear as possible, and wresting a pole-ax from one of the murderers, killed four of them, but was at length overpowered and killed. Others relate that he was starved in prison; and that, after he was denied all nourishment, he prolonged his life fourteen days, by feeding on the flocks of his bed. He died in 1399, in the thirty-fourth year of his age, and twenty-third of his reign, during which, the famous reformer Wickliff first published his doctrines. See WICKLIFF.

The Protestant accounts of this great man's rise are numerous: it is a subject, perhaps, upon which a Catholic historian should also be heard. Dr. Lingard thus introduces it:—

It is about the year 1360 that the name of Wycliffe is first mentioned in history. He was then engaged in a fierce but ridiculous controversy with the different orders of friars. They had been established in England for more than a century: and by their zeal, piety, and learning, the usual concomitants of new religious institutions, had deservedly earned the esteem of the public. Some taught with applause in the universities; many lent their aid to the parochial clergy in the discharge of their ministry; several had been raised to the episcopal dignity; and others had been employed in difficult and important negociations by their sovereigns. The reputation and prosperity of the new orders awakened the jealousy of their rivals. Fitz-Ralph, archbishop of Armagh, openly accused them before the pontiff; and Wycliffe, treading in the footsteps of Fitz-Ralph, maintained at Oxford that a life of mendicity was repugnant to the precepts of the gospel, and that the friars in practice and doctrine were involved in the guilt of fifty heresies. The men, whom he attacked, endeavoured to justify themselves by the example of Christ, who was supported by the alms of his disciples; and Wycliffe replied by this nice distinction: that Christ, though he received, did not ask; while the friars, not content with spontaneous offerings, exhorted others by their importunity and falsehoods. This controversy had no immediate result: but it is mentioned as the origin of that violent hostility to the friars which Wycliffe displayed in every subsequent stage of his life.

Archbishop Islip had founded Canterbury Hall, in Oxford, for a warden and eleven scholars, of whom eight were to be secular clergymen, the warden and three others to be monks, taken from his own convent at Christ Church. In 1365, by means with which we are not acquainted, Wycliffe superseded Woodhall the warden, and, with the approbation of the founder, expelled both him and his monks. Islip died the next year: his successor Simon Langham, alleging that the appointment of Wycliffe was contrary to the charter of foundation, and had been obtained at a time when his predecessor, from age and infirmity, was incapable of business, commanded the new warden to make place for the old; and, on his refusal, sequestrated the revenues of the hall. Wycliffe appealed to the pope, and commissioned one of the fellows to prosecute the appeal. After a tedious process, judgment was given against him: both he and his associates were expelled in turn; and the king's approbation was obtained to sanction the whole proceeding. To his disappointment at this decision has been attributed, perhaps rashly,

Wycliffe's subsequent opposition to the papal authority. He had obtained the honorary title of one of the king's chaplains, and as such strenuously maintained in the university the rights of the crown against the pretensions of the pontiff. His name stands the second on the list of commissioners, appointed to meet the papal envoys at Bruges, for the purpose of adjusting in an amicable manner the disputes between the two powers. He was afterwards preferred to a prebend in the collegiate church of Westbury. He already possessed the rectory of Fylingham, which he exchanged for that of Lutterworth, both in the diocese of Lincoln.

To accept of preferment was so contrary to the principles which he afterwards taught, that it is probable he had not yet determined to embrace the profession of a reformer. He continued, however to lecture at Oxford, and imitated in his manner of life the austerity of the men whom he so warmly opposed. He always went barefoot, and was clad in a gown of the coarsest russet. By degrees he diverted his invectives from the friars to the whole body of the clergy. The popes, the bishops, the rectors, and curates, smarted successively under the lash. Every clergyman was bound, he contended, to imitate the Saviour in poverty, as well as in virtue. But clerks possessioners, so he termed the beneficed clergy, did not imitate the poverty of Christ. They were choked with the tallow of worldly goods, and consequently were hypocrites and antichrists. By falling into sin they became traitors to their God: and of course forfeited the emoluments of their cures. In such cases it became the duty of laymen, under pain of damnation, to withhold from them their tithes, and to take from them their possessions. To disseminate these and similar principles, he collected a body of fanatics, whom he distinguished by the name of poor priests. They were clad like himself, professed their determination never to accept of any benefice, and undertook to exercise the calling of itinerant preachers without the licence, and even in opposition to the authority of the bishops.

'The coarseness of Wycliffe's invectives, and the refractory conduct of his poor priests, soon became subjects of astonishment and complaint. In the last year of Edward, while the parliament was sitting, he was summoned to answer in St. Paul's before the primate and bishop of London. He obeyed; but made his appearance between the two most powerful subjects in England, the duke of Lancaster, and Percy the lord mareschal. Their object was to intimidate his opponents: and the attempt was begun by Lancaster, who ordered a chair to be given to Wycliffe. Courtney, the bishop of London, replied that it was not customary for the accused to sit in the presence, and without the permission, of his judges. A vehement altercation ensued, and the language of Lancaster grew so abusive, that the populace rose in defence of their bishop, and had it not been for his interference, would have offered violence to his reviler. Though the duke escaped with his life, his palace of the Savoy was pillaged in the tumult which has been already described. Wycliffe found it necessary to make the best apology in his power, and was permitted to depart with a severe reprimand, and an order to be silent for the future on those subjects, which had given so much cause for complaint.'

6. *Of England under the House of Lancaster.*—After sentence of deposition had been pronounced on Richard by both houses of parliament, the throne being vacant, the duke of Lancaster stepped forth; and having crossed himself on the forehead and on the breast, and called on the name of Christ, gave in his claim to the throne 'in the name of Father, Son, and Holy Ghost, as descended by right line of blood from Henry III.' This claim was founded on a false assumption that Edmund earl of Lancaster, son of Henry III., was really the eldest brother of Edward I.; but that, by reason of some deformity in his person, he had been deprived of the succession, and Edward the younger brother imposed on the nation in his stead. The duke of Lancaster inherited from Edmund, by his mother, the right which he now pretended to the crown; though the falsehood of the story was so generally known, that he thought proper to mention it only in general terms. No opposition, however, was made to the validity of his title in parliament; and thus commenced the differences between the houses of York and Lancaster, which were not terminated but by many bloody and ruinous conflicts. The reign of Henry IV. was little less than a continued series of insurrections. In the very first parliament he called, no fewer than forty challenges were given and accepted by different barons; and though Henry had ability and address enough to forbid these duels from being fought, it was not in his power to prevent continual insurrections and combinations against himself. The most formidable one was conducted by the earl of Northumberland, and commenced A. D. 1402. The occasion of it was, that Henry denied the earl liberty to ransom some Scots prisoners, who had been taken in a skirmish with that nation. The king was desirous of detaining them in order to increase his demands upon Scotland in making peace; but as the ransom of prisoners was in that age looked upon as a right belonging to those who had taken them, the earl thought himself injured. The injury appeared the greater, Northumberland considering the king as indebted to him both for his life and crown. He now resolved therefore to dethrone Henry; and to raise to the throne young Mortimer, who was the true heir, being the son of Roger Mortimer earl of March, whom Richard II. had declared his successor. For this purpose he entered into an alliance with the Scots and Welsh, who were to make an irruption into England at the same time that he himself was to raise what forces he could to join them. But when all things were prepared, the earl found himself unable to lead on the troops, by a sudden fit of illness with which he was seized at Berwick. On this, young Percy, surnamed Hotspur, took the command, and marched towards Shrewsbury, in order to join the Welsh. But the king had happily a small army with which he intended to have acted against the Scots; and knowing the importance of celerity on such an occasion, instantly hurried down, to give battle to the rebels.

He approached Shrewsbury before a junction with the Welsh could be effected; and gladly availed himself of the impatience which foolishly urged Percy to seek an engagement. The evening before the battle he sent a manifesto to Henry; in which he renounced his allegiance, set the king at defiance, and enumerated all the grievances of which he imagined the nation might justly complain. He reproached him, and very justly, with perjury; for Henry, on his first landing in England, had sworn upon the gospels, before the earl of Northumberland, that he had no other intention but to recover possession of the duchy of Lancaster, and that he would ever remain a faithful subject to king Richard. He aggravated his guilt, in first dethroning and then murdering that prince; and in usurping on the title of the house of Mortimer; to whom, both by lineal succession and the declarations of parliament, the throne, then vacant by Richard's death, of right belonged. Several other heavy charges were brought against him; which, at that time, were productive of no other effect than to irritate the king and his adherents to the utmost. The armies on each side were in number about 12,000; and as both leaders were men of known bravery, an obstinate engagement was expected. The battle was fought on the 20th of July 1403; and never was a conflict more terrible or determined. At last Percy being killed by an unknown hand, the victory was decided in favor of the royalists. There are said to have fallen on that day near 2300 gentlemen, and 6000 private soldiers, of whom near two-thirds were of Percy's army. The earl of Northumberland having recovered from his sickness, and levied an army, was on his march to join his son; but being opposed by the earl of Westmoreland, and hearing of the defeat of the earl at Shrewsbury, he dismissed his forces, and came with a small retinue to the king at York. He pretended that his sole intention was to mediate between the contending parties; and the king thought proper to accept of his apology, and grant him a pardon. The other rebels were treated with equal lenity; and none of them, except the earl of Worcester and sir Richard Vernon, who were regarded as the chief authors of the insurrection, perished by the hands of the executioner. This lenity, however, was not sufficient to keep the kingdom quiet; one insurrection followed another almost during the whole of this reign; but either through Henry's vigilance, or the bad management of the conspirators, they never could bring their projects to bear. This reign is also remarkable for the first capital punishment inflicted on a clergyman of high rank. The archbishop of York having been concerned in an insurrection against the king, and happening to be taken prisoner, was beheaded without either indictment, trial, or defence; nor was any disturbance occasioned by this summary execution. But the most remarkable transaction of this period, was the introduction of the absurd and cruel practice of burning for heresy. Henry, while a subject, was thought to have been very favorable to the doctrines of Wickliff; but when he came to the throne, finding his possession of it very insecure, he availed himself of the superstition of the people as an auxiliary to his authority, and determined to pay his court to the clergy. There were hitherto no penal laws against heresy; not indeed through the liberality of the court of Rome, but through the stupidity of the people who were content for ages with the absurdities of the established religion. But when the learning and genius of Wickliff had once broke the fetters of prejudice, the ecclesiastics called aloud for the punishment of his disciples; and Henry resolved to gratify them. He engaged parliament to pass a law for this purpose, by which it was enacted, that when an heretic, who relapsed, or refused to abjure his opinions, was delivered over to the secular arm by the bishop or his commissaries, he should be committed to the flames in the presence of the populace. This weapon did not remain long unemployed in the hands of the clergy. William Sautré, rector of St. Osithe's in London, had been condemned by the convocation of Canterbury: his sentence was ratified by the house of peers; the king issued his writ for the execution; and he was burnt alive in 1401. The doctrines of Wickliff, however, gained ground very considerably in England. In 1405 the commons, who had been required to grant supplies, proposed to the king to seize all the temporalities of the church, and employ them as a perpetual fund to serve the exigencies of the state. They insisted that the clergy possessed a third of the lands of the kingdom; that they contributed nothing to the public burdens; and that their exorbitant riches tended only to disqualify them from performing their ministerial functions with proper zeal and attention. When this address was presented, the archbishop of Canterbury, who then attended the king, objected that the clergy, though they went not in person to the wars, sent their vassals and tenants in all cases of necessity; while at the same time they themselves who staid at home were employed night and day in offering up their prayers for the happiness and prosperity of the state. The speaker answered with a smile, that he thought the prayers of the church but a very slender supply. The archbishop, however, prevailed in the dispute; the king discouraged the application of the commons; and the lords rejected the bill which the lower house had framed for despoiling the church of her revenues. The commons were not discouraged by this repulse. In 1410 they returned to the charge with more zeal than before. They made a calculation of all the ecclesiastical revenues, which, by their account, amounted to 485,000 merks a-year, and included 18,400 ploughs of land. They proposed to divide this property among fifteen new earls, 1500 knights, 6000 esquires, and 100 hospitals; besides £20,000 a-year, which the king might keep for his own use; and they insisted that the clerical functions would be better performed than they were by 15,000 parish priests, at the rate of seven merks a piece of yearly stipend. This application was accompanied with an address for mitigating the statutes against the Wickliffites or Lollards, so that the king knew very well from what source it came. He gave the commons, however, a severe reply; and

further to satisfy the church that he was in earnest, ordered a Lollard to be burnt before the dissolution of parliament. The king had now been for some time subject to fits, which continued to increase, and gradually terminated his life. He expired at Westminster in 1413, in the forty-sixth year of his age, and thirteenth of his reign.

Henry IV. was succeeded by his son Henry V. whose martial talents and character had at first occasioned unreasonable jealousies in the mind of his father. The active spirit of Henry restrained from its proper exercise had therefore broken out in every kind of extravagance and dissipation. It is reported that he scrupled not to accompany his riotous associates in attacking passengers on the streets and highways, and robbing them. No sooner, however, did he ascend the throne, than he is said to have called together his former companions, to acquaint them with his intended reformation, and exhort them to imitate his example: but he stricly prohibited them, till they had given proofs of their sincerity in this particular, to appear any more in his presence. Those of his father's wise ministers, who had checked his riotous disposition while prince Henry, found that they had, unintentionally, been paying the highest court to their future sovereign; and were received with all the marks of favor and confidence. The chief justice, who on one occasion had actually imprisoned the prince, met with praises instead of reproaches for his past conduct, and was exhorted to persevere in the same rigorous and impartial execution of the laws. The king was not only anxious to repair his own misconduct, but also to make amends for those iniquities, into which policy or necessity had betrayed his father. He expressed the deepest sorrow for the fate of king Richard, rewarded his most attached friends, and performed his funeral obsequies with solemnity. He took into favor the young earl of March, though his competitor for the throne; and gained so far on his gentle and unambitious nature, that he remained ever after sincerely attached to him. The family of Percy was also restored to its fortune and honors; and the king seemed desirous to bury all distinctions in oblivion. Men of merit were preferred, of whatever party they had been, until all men were unanimous in their attachment to Henry; and the defects of his title were forgotten in the personal regard which he inspired. The only party which he was not able to bend to his measures, or with which the clergy, rather, would not suffer him to agree, was the new sect of Lollards. These reformers were now gaining such ground in England, that the established priesthood were alarmed, and Henry resolved to execute the laws upon them. The head of that party was sir John Oldcastle, lord Cobham; a nobleman who had distinguished himself by his valor and military talents on many occasions, and acquired the esteem both of the late and present king. His high character and zeal for the new sect pointed him out to Arundel archbishop of Canterbury, as a proper object of ecclesiastical fury, and he therefore applied to Henry for permission to indict him. The king desired him first to try gentle methods, and undertook to converse with lord Cobham himself upon religious subjects. He did so, but could not prevail, and therefore abandoned Cobham to his enemies. He was immediately condemned to the flames as a heretic: but having found means to make his escape, he raised an insurrection; which was suppressed, without any other consequence than that of leaving a stain on the character of the new sect. Lord Cobham himself made his escape, but four years afterwards was taken and executed. Immediately after, the most severe laws were enacted against the Lollards. It was declared, that whoever was convicted of Lollardy, besides suffering capital punishment according to the laws formerly established, should also forfeit his lands and goods to the king; and that the chancellor, treasurer, justices of the two benches, sheriffs, justices of the peace, and all the chief magistrates in every city and borough, should take an oath to use their utmost endeavours for the extirpation of heresy. Notwithstanding these denunciations, the very parliament which enacted them, viz. that of 1414, when the king demanded a supply, renewed the offer formerly pressed upon Henry IV., and entreated the king to seize all the ecclesiastical revenues, and convert them to the use of the crown. The clergy were greatly alarmed. They could offer the king nothing of equal value. They agreed, however, to confer on him all the priories alien, which depended on capital abbeys in Normandy, and which had been bequeathed to them when that province was united to England. The most effectual method, however, of warding off the blow, was by persuading the king to undertake a war with France, to recover the provinces which had formerly belonged to England. This was agreeable to the dying injunction of Henry IV., who advised his son never to let the English remain long in peace, which was apt to breed intestine commotions; but to employ them in foreign expeditions, by which the prince might acquire honor, the nobility in sharing his dangers might attach themselves to his person, and all the restless spirits find occupation. The natural disposition of Henry sufficiently inclined him to follow this advice, and the civil disorders of France gave him the fairest prospect of success. Accordingly, in 1415, the king invaded France at the head of 30,000 men. The rapid progress of this army will be found related under the article France. He had espoused the king's daughter, and conquered the greatest part of the kingdom. His queen was delivered of a son named Henry, whose birth was celebrated by the greatest rejoicings both at London and Paris; and the infant prince seemed to be universally regarded as heir to both monarchies. But Henry's glory, when it seemed to be approaching the summit, was blasted at once by death, and all his mighty projects vanished. He was gradually reduced by a fistula, which the surgeons of the day could not cure; and expired on the 31st of August, 1422, in the thirty-fourth of his age, and tenth of his reign.

Henry VI. succeeded to the throne while an infant not yet a year old, and his reign abounds, as we might expect, with the most dismal ac-

counts of misfortunes and civil wars. His new relatives soon began to dispute about the administration during his minority. The duke of Bedford, one of the most accomplished princes of the age, was appointed by parliament protector of England, defender of the church, and first counsellor to the king. His brother, the duke of Gloucester, was afterwards selected as regent, while he conducted the war in France; and to limit the power of both brothers, a council was named, without whose advice and approbation no measure could be carried into execution. France itself was now in the most desperate situation. The English were masters of almost the whole of it. Henry VI., while an infant, was solemnly invested with regal power by legates from Paris; so that Charles VII. of France succeeded only to a nominal kingdom. With all these advantages, however, the English daily lost ground in that country; and in the year 1450 were totally expelled from it. See FRANCE. It may easily be imagined, that such a train of bad success would produce discontents at home. The duke of Gloucester was envied by many on account of his station. Among these was Henry Beaufort, bishop of Winchester, great uncle to the king, and the legitimate son of John of Gaunt, brother to Richard II. This prelate, to whom the care of the king's education had been committed, was a man of considerable capacity and experience, but of an intriguing and dangerous disposition. He had frequent disputes with the duke of Gloucester, and the duke of Bedford in vain employed both his own authority and that of parliament to reconcile them: their mutual animosities embarrassed the government for several years. The sentiments of the two leaders were particularly divided with regard to France. The bishop embraced every prospect of accommodation with that country; and the duke of Gloucester was for maintaining the honor of the English arms, and regaining whatever had been lost. Both parties called in all the auxiliaries they could. The bishop resolved to strengthen himself by procuring a proper match for Henry, at that time twenty-three years old; and then bringing over the queen to his interests. Accordingly, the earl of Suffolk, a nobleman whom he knew to be steadfast in his attachments, was sent over to France, apparently to settle the terms of a truce which had then been begun, but in reality to procure a suitable match for the king. The bishop and his friends had cast their eye on Margaret of Anjou, daughter of Regnier, titular king of Sicily, Naples, and Jerusalem; but without either real power or possessions. She was considered as the most accomplished princess of the age, both in mind and person; and it was thought would, by her own abilities, be able to supply the defects of her husband, who appeared weak, timid, and superstitious. The treaty was therefore hastened on by Suffolk, and soon after ratified in England. The queen came immediately into the bishop's measures: Gloucester was deprived of all real power, and every possible method adopted to render him odious. One step taken for this purpose was to accuse his duchess of witchcraft. She was charged with conversing with one Bolingbroke, a priest and reputed necromancer, and also with Mary Gourdemain, supposed to be a witch. It was asserted that these three, in conjunction, had made an image of the king in wax, which was placed before a gentle fire: as the wax dissolved, the king's strength was expected to waste; and upon its total dissolution his life was to be at an end. This accusation was readily believed in a superstitious age. The prisoners were pronounced guilty; the duchess was condemned to do penance and suffer perpetual imprisonment; Bolingbroke, the priest, was hanged, and the woman burnt in Smithfield. The bishop, called also the cardinal, of Winchester, was resolved to carry his resentment against Gloucester to the utmost. He procured a parliament to be summoned, not at London, which was too well affected to the duke, but at St. Edmundsbury, where his adherents were sufficiently numerous to overawe every opponent. As soon as Gloucester appeared he was accused of treason, and thrown into prison; and on the day on which he was to make his defence, he was found dead in his bed, though without any signs of violence upon his body. The death of the duke was universally ascribed to the cardinal, who himself died six weeks after, testifying the utmost remorse, we are told, for the bloody scene in which he had so recently acted. But some writers assert that Gloucester died a natural death: and Dr. Lingard says that his supposed remorse respecting the death of the duke of Gloucester is a fiction which we owe wholly to the imagination of Shakspeare. What share the queen had in these transactions is uncertain; but most people believed that without her knowledge the duke's enemies durst not have venventured to attack him. The king himself shared in the general ill will, and he never had the art to remove the suspicion. His great incapacity was every day more apparent; and a pretender to the throne made his appearance in 1450, in the person of Richard duke of York. All the males of the house of Mortimer were extinct; but Anne, the sister of the last earl of March, having espoused the earl of Cambridge, who had been beheaded for treason in the reign of Henry V., had transmitted her latent, but not yet forgotten claim, to her son Richard. This prince, descended by his mother from Philippa, only daughter of the duke of Clarence, and second son of Edward III. stood plainly in order of succession before the king, who derived his descent from the duke of Lancaster, third son of that monarch. The duke was a man of valor and abilities, as well as of some ambition; and he thought the weakness and unpopularity of the present reign afforded a favorable opportunity to assert his title. The ensign of Richard was a white rose, that of Henry a red one; and these gave their names to the two factions, who were now about to drench the kingdom in blood. After the cardinal of Winchester's death, the duke of Suffolk, who had perhaps also been concerned in the assassination of Gloucester, governed every thing with uncontrollable sway. His conduct excited the

jealousy of the other nobility, and every odious or unsuccessful measure was attributed to him. The duke, however, boldly called upon his enemies to show an instance of his guilt. The house of commons immediately opened against him a charge of corruption, tyranny, and treason. He was accused of being the cause of the loss of France—of persuading the French king, with an armed force, to invade England—and of betraying the secrets of state. The popular resentment against him was so strong, that Henry, to secure him as much as possible, sentenced him to five years banishment. This was considered by his enemies as an escape from justice. The captain of a ship was therefore employed to intercept him in his passage to France. He was seized near Dover, his head struck off on the side of a long boat, and his body thrown into the sea.

The complaints against Henry's government were heightened by an insurrection, headed by one John Cade, a native of Ireland. He had been obliged to fly over into France for his crimes; but, on his return, seeing the people prepared for violent measures, he assumed the name of Mortimer; and, at the head of 20,000 Kentish men, advanced towards Blackheath. The king sent a message to demand the cause of their rising in arms. Cade, in the name of the community, answered, that their only aim was to punish evil ministers, and procure a redress of grievances for the people. On this a body of 15,000 troops were levied, and Henry marched with them in person against Cade, who retired on his approach, as if he had been afraid of coming to an engagement. He lay in ambush, however, in a wood, not doubting but he should be pursued by the king's whole army: but Henry was content with sending a detachment after the fugitives, and returning to London himself; upon which Cade issued from his ambuscade, and cut the detachment in pieces. Soon after, the citizens of London opened their gates to the victor, and Cade, for some time, maintained great order and regularity among his followers. He always led them out into the fields in the night-time, and published several edicts against plunder and violence of any kind. He was not, however, long able to keep his people in subjection. He beheaded the treasurer, lord Say, without any trial; and soon after, his troops committing some irregularities, the citizens resolved to shut their gates against him. Cade endeavouring to force his way, a battle ensued, which lasted all day, and was ended only by the approach of night. The archbishop of Canterbury and the chancellor, who had taken refuge in the Tower, being informed of the situation of affairs, drew up, during the night, an act of amnesty, which was privately dispersed among the rebels. This had such an effect, that in the morning Cade found himself abandoned by the greater part of his followers, and retreating to Rochester, was obliged to fly alone into the woods. A price being set on his head by proclamation, he was discovered and slain by one Alexander Eden; who, in recompense for his service was made governor of Dover Castle. The court now began to entertain suspicions that the insurrection of John Cade had not happened merely in consequence of his own machinations and ambition, but that he had been instigated thereto by the duke of York. As he was about this time expected to return from Ireland, and a report took place that he was now to assert his right by force of arms, orders were issued in the king's name to deny him entrance into England. This was prevented by his appearing with no more than his ordinary attendants; but though he thus escaped the present danger, he saw the necessity of instantly proceeding in support of his claim. His partizans were instructed to distinguish between his right by succession, and by the laws of the kingdom. The adherents of Lancaster maintained, that though the advancement of Henry IV. might be looked upon as irregular, yet it was founded upon general consent; or even allowing it to have been at first invalid, it had now been for a long time established, and acquired solidity of consequence; nor could the right of succession at any rate be pleaded for the purpose of overthrowing the general peace and tranquillity of the kingdom. The principles of liberty as well as the maxims of true policy had been injured by the house of York; while the public were bound to those of Lancaster, no less by political than moral duty, in consequence of the oaths of fealty that had been so often sworn to them; the duke of York himself having repeatedly sworn allegiance to them, and thus renounced those claims which he now brought forward to disturb the public tranquillity. On the part of the duke of York, it was replied, that the good of the people required the maintenance of order in the succession of princes; that by adhering constantly to this rule, a number of inconveniences would be prevented which must otherwise ensue; and though that order had been broken through in the case of Henry IV. it was never too late to remedy any pernicious precedent. It would indeed be a great encouragement to usurpers, if the immediate possession of power, or their continuance in it for a few years, could convert them into legal princes; and the people must be in a very miserable situation, if all restraints on violence and ambition were taken off, and full liberty given to every innovator to make what attempts he pleased. They did not indeed deny that time might confer solidity on a government originally founded in usurpation; but a very long course of years was not only required for this purpose, but a total extinction of those who had any just title. The disposition of Richard II. and advancement of Henry IV. were not legal acts, but the effects of mere levity in the people; in which the house of York had acquiesced from necessity, and not from any belief of the justice of their cause; nor could this be ever interpreted into any renunciation of their pretensions; neither could the restoration of the true order of succession be considered as an encouragement to rebellion, but as the correction of a former abuse by which rebellion had been encouraged. Besides, the original title of Henry IV. was founded entirely on present convenience; and even this was now entirely shifted to the house of York. The present prince was evidently incapable of

governing the kingdom by reason of his imbecility; so that every thing was governed either by corrupt ministers or an imperious queen, who engaged the nation in foreign connexions entirely contrary to its interests; while, on the other hand, the true heir of the crown was a prince of approved judgment and experience, and a native of England, who, by his restoration, would undoubtedly correct all those abuses of which there was now such just reason to complain. In this dispute it was evident that the house of York had the better in point of argument: nevertheless, as a prince of the house of Lancaster was in immediate possession of the throne, and could not be charged with any crime, the cause of the former was less generally interesting; especially as it must always have been uncertain, *a priori*, whether the duke of York would have governed any better than king Henry. After his return from Ireland, however, the former used all his power and influence to foment the discontents which had for some time prevailed in the kingdom; and the conduct of the next parliament manifested the success of his intrigues. A violent attack was made upon such noblemen as were known to be most in favor with the king. The house of commons presented a petition against the duke of Somerset, the duchess of Suffolk, the bishop of Chester, lord Dudley, and several others of inferior rank; praying not only that the king would remove them from his council, but that he would prohibit them from coming within twelve miles of the court. Henry, not daring to refuse this petition altogether, consented to banish all those of inferior rank, whom the commons had specified, but only for a year; and this too on condition that he had no use for their assistance in quelling any rebellion. But he rejected a bill for attainting the late duke of Suffolk, and proposed some other measures which seemed to militate against the court, though it had passed both the house of lords and the house of commons. Encouraged by this disagreement between Henry and his parliament, the duke of York raised an army of 10,000 men, with whom he marched towards London, demanding a reformation in government, and the removal of the duke of Somerset. This first enterprise, however, proved unsuccessful; the gates of the city were shut against him, and he was pursued by the king at the head of a superior army. On this he retired into Kent; and, as there were many of his own friends in the army of the king, a conference took place, in which Richard still insisted upon the removal of the duke of Somerset, and his submitting to be tried in parliament. This request was in appearance complied with, and Somerset arrested: the duke of York was then persuaded to wait upon the king in his pavilion; but, on repeating his charge against the duke, he was surprised to see the latter come out from behind the curtain, and offer to maintain his innocence. Richard perceiving that he had not sufficient interest to ruin his adversary, pretended to be satisfied, and retired to his seat at Wigmore in Wales. During the time he resided there, a better opportunity was given him of accomplishing nis designs than he could have hoped for. The king fell into a kind of lethargic disorder, which greatly increased his natural imbecility. Richard now had interest enough to get himself appointed protector, with power to hold parliaments at pleasure; with which high office he was no sooner invested, than he turned out all the Lancastrian party from their offices, and sent the duke of Somerset to the Tower: but, on the recovery of the king, which happened not long after, he himself was dismissed from his employment, the duke of Somerset released, and the administration once more put into his hands. On this the duke of York levied an army, merely, as he pretended, to enforce the reformation of government and the removal of Somerset. Thus Henry was obliged to face him in the field. A battle ensued at St. Alban's; in which the royalists were defeated, and the duke of Somerset, the chief partizan of their cause, killed in the action. The king himself was wounded, and took shelter in a cottage near the field of battle; where he was taken prisoner, but was afterwards treated with great respect and kindness by the duke of York; and Henry, though now only a prisoner treated with the forms of royalty, became pleased with his situation. But his queen, a woman of a bold and masculine spirit, could not bear their present degradation. She therefore excited the king once more to assert his right by force of arms; and, after several manœuvres, the duke of York was obliged to retire from court. A negociation for peace was at first set on foot, but the mutual distrust of both parties broke it off. The armies met at Bloreheath on the borders of Staffordshire, on the 23d of September, 1459; and the Yorkists at first gained some advantages. But when a more general engagement was about to ensue, a body of veterans who served under the duke of York deserted to the king; which so intimidated the duke's party, that they separated the next day without striking a blow. The duke of York fled to Ireland; and the earl of Warwick, one of his ablest and best supporters, escaped to Calais, with the government of which he had been entrusted during the late protectorship. The York party, though thus in appearance suppressed, only waited a favorable opportunity of retrieving their affairs. Nor was this long wanting. Warwick having met with some success at sea, landed in Kent; and, being there joined by other barons, marched up to London amidst the acclamations of the people, and soon found himself in a condition to face the royal army. An engagement ensued at Northampton on the 10th of July 1460; in which the royalists were entirely defeated, and the king again taken prisoner. The duke of York then openly laid claim to the crown; and on this occasion the first glance of a spirit of national liberty is said to have appeared in the house of lords. The cause of Henry and the duke of York was solemnly debated; and the latter, though a conqueror, did not absolutely gain his cause. It was determined that Henry should possess the throne during his life; and that the duke of York should be appointed his successor, to the exclusion of the prince of Wales, then a child. Though the royal party now seemed destitute of every resource, the queen still retained her intrepidity. She fled into Wales, where she endeavoured to raise another army.

The northern barons, provoked at the southern ones for settling the government and succession to the crown without their consent, soon furnished her with an army of 20,000 men. Another battle was fought near Wakefield Green, on the 24th of December, 1460. The Yorkists were defeated, and the duke himself was killed in the action. His head was afterwards cut off by the queen's orders, and fixed on one of the gates of York, with a paper crown, in derision of his title. His son, the earl of Rutland, a youth of seventeen, was taken prisoner, and killed in cold blood by lord Clifford, in revenge for his father's death, who had fallen in the battle of St. Alban's. After this victory, Margaret marched towards London, to set the king at liberty; but the earl of Warwick, who now put himself at the head of the Yorkists, led about the captive king, in order to give a sanction to his proceedings. He engaged the queen's forces at St. Alban's; but, through the treachery of lord Lovelace, who deserted during the heat of the engagement with a considerable body of forces, Warwick was defeated, and the king fell once more into the hands of his own party. The submission of the city of London seemed now to be the only thing wanting to complete the queen's success; but Warwick had secured it in his interests, and the citizens refused to open their gates to the queen. In the mean time young Edward, eldest son of the late duke of York, put himself at the head of his father's party. He was now in the bloom of youth, remarkable for his bravery and the beauty of his person. He defeated Jasper Tudor, earl of Pembroke, at Mortimer's Cross in Herefordshire. The earl himself was taken prisoner, and immediately beheaded by Edward's orders. After this, the latter advanced to London; and, being joined by the remainder of Warwick's army, he soon obliged Margaret to retire, entered the city amidst the acclamations of the people, and was crowned king on the 5th of March, 1461.

7. *Of England under the House of York.*—Queen Margaret, notwithstanding her misfortunes, still continued undaunted. She retired to the north, where she was soon joined by such numbers, that her army amounted to 60,000 men. She was opposed by young Edward and Warwick at the head of 40,000; and both armies met near Touton in Yorkshire, on the 29th of March, 1461. A bloody battle ensued, in which the queen's army was totally defeated; and as Edward, prompted by his natural cruelty, had ordered no quarter to be given, 40,000 of the Lancastrians were slain in the field or in the pursuit. Edward is said to have obtained this victory principally through a violent storm of snow blowing full in the face of the queen's army, and almost incapacitating them for the use of their arms. After this disaster the queen fled to Scotland with her husband and son; whence, assisted by the king of France, she again entered England at the head of 5000 men. Her little fleet, however, was dispersed by a tempest, and she herself escaped with the utmost difficulty by entering the mouth of the Tweed. Soon after, a defeat, which her few forces sustained at Hexham, seemed to render her cause desperate; and the cruelties practised upon her adherents rendered it very dangerous to befriend her. The house of Lancaster, in fact, was now in its wane, so that Margaret was obliged to separate from her husband. The king, protected by some of his friends, remained in Lancashire for a twelvemonth; but, being at last discovered, he was thrown into the Tower and kept close prisoner. The queen fled with her son to a forest, where she fell into the hands of banditti, who stripped her of her rings and jewels, and treated her with the utmost indignity. A quarrel which happened among them about the division of the spoil, afforded her, however, an opportunity of escape into another part of the forest, where she wandered for some time. At last, when spent with hunger and fatigue, she saw a robber approaching her with a drawn sword in his hand. Finding it impossible to escape, she took the resolution of putting herself under his protection. Advancing towards him, therefore, and presenting the young prince, 'Here,' said she, 'my friend, I commit to your care the safety of your king's son.' This address so much surprised the man, that, instead of offering her any injury, he professed himself devoted to her service; and, after living for some time concealed in the forest, she was conducted by him and his associates to the sea-side, where she found a ship which conveyed her to Flanders. On her arrival she went to her father's house, and awaited in this retreat some years an opportunity of retrieving her affairs.

Edward, in the mean time, believing himself securely possessed of the throne, gave a loose to his favorite passions; one of which was an immoderate love of women. To divert him from this, the earl of Warwick, to whom he was indebted for his crown, advised him to marry. Edward consented, and sent him over to the continent to negociate a match with the princess of Savoy. The negociation proved successful; but, in the mean time, the king had privately espoused Elizabeth Woodville, daughter of Sir Philip Woodville, who had married the duchess of Bedford after the death of her first husband. Edward had in vain employed the arts of seduction against this lady before he married her; but unfortunately the match was concluded just at the time that the earl of Warwick had proved successful in his negociation with the princess of Savoy. The minister therefore returned full of indignation against his sovereign: and Edward, forgetting the just reason for offence he had given him, determined to remove him from his councils. Warwick was likewise disgusted by the favor shown to the queen's party. A plan of revenge was, therefore, now conceived; and a most powerful combination was formed against Edward; to accomplish which, Warwick not only employed all his own influence, which was very extensive, but likewise that of the duke of Clarence, Edward's brother, to whom the earl had allied himself by giving him his daughter in marriage. Various circumstances of the time also favored this scheme. The inhabitants of the neighbourhood of St. Leonard's in Yorkshire, complained that the duties levied for that institution, and which had been originally appointed for pious purposes, were secreted by

the managers. As the clergy were concerned in this affair, they attempted to silence their antagonists by ecclesiastical fulminations; upon which the latter took up arms, fell upon the officers of the hospital, and having massacred them, proceeded towards York, to the number of 150,000. In the first skirmish, the insurgents had the misfortune to lose their leader, who was instantly executed. They, however, still continued in arms, and in a short time appeared in such numbers as to become formidable to the government. Henry, earl of Pembroke, was first sent against them with a body of 5000 men; and having taken Sir Henry Nevil, one of their leaders, prisoner, instantly put him to death: this was soon revenged by a similar doom being pronounced on himself, on his being defeated and taken prisoner. His defeat had been occasioned by a disagreement with the earl of Devonshire; in consequence of which the latter had gone off with his troops. The king enraged at this, now caused Devonshire to be executed in a summary manner, but this was of no service to his cause; a new body of insurgents appeared under Sir Robert Welles, son to a nobleman of that name. The latter, to secure himself from all suspicion of disloyalty, fled to a monastery; but he was soon enticed from thence, and put to death. His son soon after shared the same fate, being defeated and taken prisoner by Edward, who instantly ordered him to be beheaded, along with Sir Thomas Launde, and other persons of distinction. Notwithstanding this appearance of a general insurrection, the king had so little suspicion of the loyalty of Warwick and Clarence, that he employed them in raising troops to quell the insurgents. Instead of executing their commission with fidelity, however, they joined the malcontents with all the forces they could raise; but, disconcerted by the defeat and death of Welles, they retired to Lancashire, in hopes of being joined by lord Stanley, who had married the earl of Warwick's sister. Disappointed in this, they were obliged to disband their army and fly into Devonshire, whence they set sail for the continent. Upon their arrival at Calais, the deputy-governor, whom Warwick had left, refused him admittance; nor would he even allow the duchess of Clarence to land, though she had been deliveredof a son on board only a very few days before. He, however, made an apology to Warwick for this behaviour, and the latter pretended to be reconciled, but immediately left the place, having seized some Flemish vessels which he found in the neighbourhood. As a very close alliance subsisted between Warwick and the duke of Burgundy, the king of France now received him with the greatest marks of esteem. A reconciliation also took place between him and the unfortunate queen Margaret, and a French fleet was prepared to reconduct them to England. They landed together at Dartmouth, with a small body of troops, while Edward was in the north suppressing an insurrection. In less than six days Warwick found himself at the head of 60,000 men. Edward was now, in his turn, obliged to fly the kingdom. Having narrowly escaped an attempt made upon his person by the marquis of Montague, he embarked for Holland, on board a small fleet at Lynn in Norfolk. While at sea, he was chased by some ships belonging to the Hanse Towns, then at war both with France and England; but at length, landed safely on the Flemish coast, where he met with but an indifferent reception from the duke of Burgundy, with whom he had lately entered into an alliance. Warwick, in the mean time, advanced to London, and once more released and placed Henry VI. on the throne. A parliament was called, which solemnly confirmed the king's title; Warwick himself being dignified by the people with the title of the king-maker. All the attainders of the Lancastrians were reversed, and every one was restored who had lost either honors or fortune by his former adherence to Henry's cause. Edward's friends fled to the continent, or took shelter in monasteries: but his party was not yet destroyed. After an absence of nine months, being seconded by a small body of troops granted him by the duke of Burgundy, he made a descent on Ravenspur in Yorkshire, and first met with little success; but his army increasing on his march, he was soon in a condition to appear before the capital. The unfortunate Henry was now again, therefore, dislodged from his throne, and the hopes of Warwick were almost totally blasted by the defection of Clarence, Edward's brother. Warwick knew his forces to be inferior to those of Edward, but placed great dependence on his own generalship. He, therefore, advanced to Barnet, within ten miles of London, where he resolved to give battle to Edward. The latter soon came up with him, and on the 14th of April 1471, a most obstinate and bloody conflict ensued. Edward, as usual, had ordered no quarter to be given; and, obtained the victory through a mistake of a body of Warwick's forces, who fell with fury on their own party instead of the enemy. The earl himself was slain, together with his brother, and 10,000 of his bravest followers. The queen was just then returned with her son from France, where she had been soliciting supplies. She had scarcely time to refresh herself from the fatigue of the voyage, when she received the fatal news of the death of Warwick, and the total destruction of her party. Her grief now, for the first time, it is said, manifested itself by tears; and she immediately took sanctuary in the abbey of Beaulieu in Hampshire. Here she found Tudor, earl of Pembroke, Courtney, earl of Devonshire, the lords Wenlock and St. John, with some other men of rank, willing to assist her. On this assurance, she resumed her courage; and, advancing through the counties of Devon, Somerset, and Gloucester, increased her army every day. At last, however, she was overtaken by the victorious Edward at Tewkesbury, on the banks of the Severn. The queen's army was totally defeated; the earl of Devonshire and lord Wenlock were killed in the field; the duke of Somerset, and about twenty other persons of distinction, who had taken shelter in a church, were dragged out, and beheaded; about 3000 of the party fell in battle, and the army was entirely dispersed. Queen Margaret and her son

being taken prisoners, and brought to the king, the latter asked the prince, in an insulting manner, how he dared to invade his dominions? The young prince replied, that he came thither to claim his just inheritance; upon which Edward struck him on the face with his gauntlet. The dukes of Clarence and Gloucester, lord Hastings, and Sir Thomas Gray, taking this blow as a signal for violence, hurried the prince into the next apartment, and there despatched him with their daggers. Margaret was thrown into the Tower along with her husband Henry, who expired in that confinement a few days after. It was universally believed that he was murdered by the duke of Gloucester, though of this there is no direct evidence. Margaret was ransomed by the king of France for 50,000 crowns, and died a few years after in that country. Edward being now freed from all his enemies, began to punish those who had appeared against him. Among the various cruelties he committed, the manner in which he put his brother, the duke of Clarence, to death, was perhaps the most remarkable. The king, happening to be one day hunting, a servant of the duke killed a white buck, which was a great favorite of the owner of the park, named Burdet, who vexed at the loss, broke out into a passion, and wished the horns of the deer in the belly of the person who advised the king to that insult. For this exclamation, Burdet was tried for his life, and executed at Tyburn. The duke of Clarence exclaimed against the iniquity of this sentence; upon which, he was arraigned before the house of peers, found guilty, and condemned to death. The only favor granted him was to have the choice of his death; and this is said to have been a singular one, namely, to be drowned in a butt of Malmsey wine. But the whole of this story respecting Clarence, is very differently told by some writers. Having lost his duchess in 1476, he is said to have aspired to the hand of Mary, heiress of the late duke of Burgundy, and thus to have excited the jealousy of his brother. At this time, two of the servants of the duke, Stacey and Burdet, were accused of practising magic, of having calculated the nativities of the king and princes, and of having circulated seditious songs. Clarence interfered upon their trial, we are told, to establish their innocence, and the day after their execution introduced their confessor into the council-chamber to confirm it by their dying declarations. When the king learnt these particulars, he upbraided the duke with insulting the administration of justice; and, in the presence of the lord mayor of London and the sheriffs, committed him to the Tower. A long bill of attainder against him appears in Rot. Parl. vi. 193, 4. Dr. Lingard says he died in the Tower; but 'the manner of his death has never been ascertained.' The rest of the reign of Edward affords little else than a history of the king's amours. Among his many mistresses, the celebrated Jane Shore deserves some mention. Historians represent her as extremely beautiful, cheerful, and of uncommon intellect and generosity. The king, it is said, was no less captivated with her mind than with her person: if ever she importuned him it was in favor of the unfortunate. After the death of Edward, she attached herself to lord Hastings; and, when Richard III. cut off that nobleman as an obstacle to his ambitious schemes, Jane Shore was arrested as an accomplice, on the ridiculous accusation of witchcraft. This, however, terminated only in a public penance; excepting that Richard rifled her of all her little property; but, whatever severity might have been exercised towards her, it appears that she was alive, though sufficiently wretched, in the reign of Henry VIII., when Sir Thomas More saw her poor, old, and shrivelled, without the least trace of her former beauty. Rowe, in his tragedy of Jane Shore, has adopted the popular story, related in the old historical ballad, of her perishing by hunger in a ditch, where Shoreditch now stands. But Stowe assures us that street was so named before her time. The king died on the 9th of April 1482, in the forty-second year of his age, and the twenty-first of his reign, counting from his first assuming the crown. Besides five daughters, he left two sons; Edward, prince of Wales, his successor, then in his thirteenth year; and Richard, duke of York, in his ninth.

On the death of Edward IV. the kingdom was divided into new factions. The queen's family, which, during the last reign, had come into power, was become obnoxious to the old nobility, who considered them as their inferiors. The king had endeavoured to prevent these animosities from coming to a height, by desiring, on his death-bed, that his brother Richard, duke of Gloucester, should be entrusted with the regency; and recommended peace and unanimity during the minority of his son. But the king was no sooner dead, than the former resentment between these parties broke out with violence; and the duke of Gloucester was resolved to profit by these contentions. His first step was to get himself declared protector of the realm; and, having arrested the earl of Rivers, the king's uncle and guardian, he met young Edward in his way from Ludlow Castle, where the late king had resided during the latter part of his reign, and respectfully offered to conduct him to London. Having thus secured the king, he next obtained possession of his brother's person. The queen had retired with this child into Westminster Abbey; and it was with extreme reluctance, that she delivered him up, at the intercession of the primate and the archbishop of York. In the course of a few days, Gloucester conveyed the two princes to the Tower, under pretence of guarding them from danger; and soon after this spread reports of their illegitimacy; and, by pretended obstacles, put off the young king's coronation. Lord Stanley first began to suspect his designs, and communicated his suspicions to lord Hastings, who had long been firmly attached to the king's family. Hastings would not at first give credit to the surmises of his friend, but he soon had a fatal proof of the truth of it. On the 13th of June, 1483, he was hurried out of the council-room in the Tower by Gloucester's order, and beheaded on a log of timber. The soldiers who carried him off, made a bustle, as if an attempt had been made to

rescue him; and one of them made a blow at lord Stanley's head with a pole-axe; but he escaped by shrinking under the table. The same day were executed the earl Rivers, and some others, who had committed no other crime than being faithful to the young king. The protector now thought he might with safety lay claim to the throne. He had previously gained over the duke of Buckingham, a nobleman of great influence; and he used his utmost endeavours to inspire the people with a notion of the illegitimate birth of the late king. Dr. Shaw, a popular preacher, was also employed to harangue the people to this effect at St. Paul's cross. Having expatiated on the incontinence of the queen, and the illegality of the young king's title, he added a warm panegyric on the virtues of the protector. 'It is the protector,' continued he, 'who carries in his face the image of virtue, and the marks of a true descent. He alone can restore the lost glory and honor of the nation.' It was hoped that on this occasion some of the populace would have cried out, 'Long live king Richard!' but on their remaining silent, the duke of Buckingham undertook in his turn, to address them. Having expatiated on the calamities of the last reign, and the illegitimacy of the present race, he told the people that he saw only one method of warding off the miseries which threatened the state, which was by electing the protector king. He was only apprehensive, that he would never be prevailed upon to accept a crown encompassed with such difficulty and danger. He then boldly asked his auditors whether they would have the protector for their king? when a total silence ensued. The mayor, who was in the secret, observed, that the citizens were not accustomed to be harangued by a man of his quality, and would only give an answer to their recorder. This officer, therefore, repeated the duke's speech; but the people still continued silent. 'This is strange obstinacy,' the duke observed, 'we only require of you, in plain terms, to declare, whether or not you will have the duke of Gloucester for your king; as the lords and commons have sufficient power without your concurrence?' At this, some of the apprentices, incited by the servants of the protector and Buckingham, raised a feeble cry of 'God save king Richard!' The mob repeated the cry; and throwing up their caps into the air, cried out, 'A Richard! A Richard!'.

This scene is well drawn by Dr. Lingard.—In the morning Buckingham, with several lords and gentlemen, and Shaw with principal citizens, proceeded to the palace, and demanded an audience. The protector affected to be surprised at their arrival: expressed apprehensions for his safety; and when at last he showed himself at a window, appeared before them with strong marks of embarrassment and perturbation. Buckingham, with his permission, presented to him an address, which, having been afterwards embodied in act of parliament, still exists for the information of posterity. It is styled the consideration, election, and petition, of the lords spiritual and temporal, and commons of this realm of England: and after an exaggerated picture of the former prosperity of the kingdom, and of its misery under the late king, proceeds thus: 'Also we consider how the pretended marriage betwixt the above-named king Edward and Elizabeth Gray, was made of great presumption, without the knowing and assent of the lords of this land, and also by sorcery and witchcraft committed by the said Elizabeth and her mother Jacquetta, duchess of Bedford, as the common opinion of the public voice and fame is throughout all this land, and hereafter, if and as the case shall require, shall be proved sufficiently in time and place convenient: and here also we consider how that the said pretended marriage was made privily and secretly, without edition of bans, in a private chamber, a profane place, and not openly in the face of the church after the law of God's church, but contrary thereunto, and the laudable custom of the church of England: and how also that at the time of the contract of the said pretended marriage, and before and long after, the said king Edward was and stood married and troth plight to one dame Eleanor Butteler, daughter of the old earl of Shrewsbury, with whom the said king Edward had made a precontract of matrimony long time before he made the said pretended marriage with the said Elizabeth Gray in manner and form aforesaid: which premises being true, as in very truth they be true, it appeareth evidently that the said king Edward, during his life, and the said Elizabeth, lived together sinfully and damnably in adultery against the law of God and of his church. Also it appeareth evidently and followeth, that all the issue and children of the said king Edward be bastards, and unable to inherit or to claim any thing by inheritance, by the law and custom of England.' Next is recited the attainder of the duke of Clarence, by which his children were debarred from the succession, and thence it is inferred that the protector is the next heir to Richard, late duke of York. 'And hereupon,' continues the petition, 'we humbly desire, pray and require your noble grace, that according to this election of us the three estates of your land, as by your true inheritance, you will accept and take upon you the said crown and royal dignity, with all things thereto annexed and appertaining, as to you of right belonging, as well by inheritance as by lawful election.'

'The protector was careful not to dispute the truth of these assertions. But he replied with modesty, that he was not ambitious; that royalty had no charms for him; that he was much attached to the children of his brother, and resolved to preserve the crown that it might grace the brow of his nephew. 'Sir,' returned the duke of Buckingham, 'the free people of England will never crouch to the rule of a bastard, and if the lawful heir refuse the sceptre, they know where to find one who will cheerfully accept it.' At these words Richard affected to pause; and after a short silence replied, 'that it was his duty to obey the voice of his people; that since he was the true heir, and had been chosen by the three estates, he assented to their petition, and would from that day take upon himself the royal estate, pre-eminence, and kingdom of the two noble realms of England and France, the one from that day forward by him and his heirs

to rule, the other by God's good grace and their good help to get again and subdue.'

After this farce was acted, Buckingham, on the 24th of June, 1483, waited on the protector with the offer of the crown, which with great affected modesty, he declined; till being told, that the people, in case of his refusal, must look out for one that would be more compliant, he accepted the government of England and France, with a resolution, as he said, to defend the one and subdue the other. The first step taken by the new king, it is said, was to send orders to Sir Robert Brackenbury, governor of the Tower, to put the young princes to death. But this he refused; and answered, that he knew not how to embrue his hands in innocent blood. A fit instrument for this purpose, however, was not long wanting. Sir James Tyrrel readily undertook the office, and Brackenbury was ordered to resign the keys to him for one night. Tyrrel, with three associates, Slater, Deighton, and Forest, came therefore, in the night to the door of the chamber where the princes were sleeping, and while he waited on the outside, the others smothered them with the bolster and pillows; after which they exhibited their bodies to Tyrrel, who ordered them to be buried under a heap of stones at the foot of the stairs. These circumstances are said to have been confessed in the succeeding reign, though the perpetrators escaped punishment. The bodies of the two princes were at that time sought for without success; but in the time of Charles I. the bones of two young persons, answering to their age, were found in a spot not unlikely to be that where they were buried, and which, being supposed to be the remains of these unfortunate princes, were buried under a marble monument in Westminster Abbey.

Richard having thus, as he imagined, secured himself on the throne, attempted to strengthen his interest by foreign alliances, while he procured the favor of the clergy at home by most unlimited indulgence; but he soon found his power threatened from an unsuspected quarter. The duke of Buckingham, who had been so instrumental in raising him to the throne did not think himself sufficiently rewarded. Having demanded some confiscated lands in Hereford, to which his family had an ancient claim, Richard but partially and reluctantly complied with his request, so that a coolness soon ensued between them, and in a short time this powerful nobleman was in heart a traitor to Richard's cause. He is said to have deliberated for some time whether he should assume the crown himself or set up another claimant. At length he determined on the latter; and resolved to declare for Henry earl of Richmond, the only surviving branch of the house of Lancaster, who was at that time an exile in Brittany. He had long lived abroad, and was once delivered over to the ambassadors of Edward IV, who were preparing to carry him to England, when the duke of Brittany, who had betrayed him, repented, and took him from the ambassadors just as they were embarking with him on ship-board. The cruelty of Richard now inclined the people to favor his pretensions; and, to give them additional strength, a match was projected betwixt him and the princess Elizabeth, the eldest daughter of Edward IV. When Richard first began to entertain doubts of the fidelity of Buckingham, he sent for him to court, determined to sacrifice him to his safety, but Buckingham, instead of obeying the summons, fled into Wales, and raised a considerable army. Richard hastened to meet him with all the forces he could command, when the march of Buckingham being retarded by an uncommon inundation of the Severn, his troops were so disheartened, that they almost all deserted him; he was obliged to fly for safety to the cottage of an old servant named Banister, in Shropshire, and Richard set a price upon his head. The cupidity of Banister was tempted, it is said, and he betrayed Buckingham to the sheriff of the county, by whom he was seized and conducted to Richard at Salisbury, who caused him to be forthwith beheaded in the market-place. The earl of Richmond, in the mean time, had set sail from St. Maloes, with a body of 5000 men; but after his arrival in England, receiving the disagreeable news of Buckingham's misfortune, he set sail again for Bretagne; while Richard, emboldened by his success, determined to confirm his title to the throne by calling a parliament. At present, matters were so circumstanced, that the parliament had no other resource than to comply with his desires, and acknowledge his right to the crown. An act was therefore, passed, confirming the illegitimacy of Edward's children; and an attainder was confirmed against the earl of Richmond; the duties of tonnage and poundage were granted to the king for life; and his only son Edward, then about twelve years of age, was created prince of Wales. In return for these concessions, Richard passed several popular and conciliatory laws. He paid his court also to the queen dowager with such assiduity and success, that she left her sanctuary, and put herself and her daughters into his hands. He had already married Anne, the second daughter of the earl of Warwick, and widow of Edward prince of Wales, whom he himself had murdered; but she having borne him but one son who died about this time, he considered her as an obstacle to his ambitious projects, and is said to have taken her off at this time: as he knew of a projected match between the earl of Richmond and the princess Elizabeth, which would make the rivalship of the former still more formidable, he now resolved to obtain a dispensation from the pope for marrying her himself. The queen dowager is even said to have come into this scheme, while the princess rejected his addresses with abhorrence. Before, however, he could accomplish this union he received news of Richmond's preparations for embarking for England. These being completed, he set sail from Harfleur in Normandy, and landed without opposition, on the 17th of August, 1485, at Milford Haven in Wales. Richard, in the mean time, had posted himself at Nottingham. Sir Rice ap Thomas and Sir Walter Herbert being commissioned to oppose his rival in Wales; the former immediately deserted to him, and the latter made but a feeble resistance. The usurper now, therefore, resolved to meet his antagonist at once, and to risk every thing on the event of a

battle. Richmond, on the other hand, though he had not above 6000 men, and the king nearly double that number, did not decline the combat, encouraged chiefly by the promises of lord Stanley to join him with a body of 7000 men, with which he hovered near the intended field of action, not far from Leicester. The king entrusted his van to the duke of Norfolk, while he himself, with the crown on his head, took the command of the main body. Lord Stanley in the mean time posted himself on one flank between the two armies, while his brother Sir William took his station directly opposite. As his intention of either joining the enemy or keeping neutral during the time of the engagement was now far from being doubtful, Richard sent him orders to join the main body; which not being complied with, the tyrant determined to put to death his son, who had been left with him as a pledge of Stanley's fidelity. He was persuaded, however, to defer the execution till after the engagement, that Stanley might thereby be induced to delay his purpose of joining the enemy. This he did not long do; and by joining Richmond's forces, entirely decided the fortune of the day. The tyrant now perceiving his situation to be desperate, and seeing his rival at no great distance, rode towards him with great fury, in hopes that either Henry's death or his own would decide the victory. He killed Sir W. Brandon the earl's standard bearer; dismounted Sir John Cheyney; and was within reach of Richmond, when Sir William Stanley' breaking in with his troops, Richard was surrounded and overwhelmed by numbers. His body was afterwards found in the field, covered with the dead bodies of his enemies. It was thrown carelessly across a horse, carried to Leicester amidst the shouts of insulting spectators, and interred in the Gray-Friar's church of that place. The usurper's crown being found on the field of battle, was placed on the head of Richmond, both armies saluting him with shouts of 'Long live king Henry!'

8. *Of England under the house of Tudor.*—Two days after the battle, Henry gave orders to confine Edward Plantagenet, earl of Warwick, son of the unfortunate duke of Clarence, and to release the princess Elizabeth, who had been confined in the Tower. He then advanced by slow marches to the city of London, where he was very satisfactorily received. He was crowned king of England on the 30th of October, 1485; and, to heighten the splendor of that occasion, bestowed the rank of knights banneret on twelve persons, and conferred peerages on three. Jasper earl of Pembroke, his uncle, he created duke of Bedford; Thomas lord Stanley his father-in-law, earl of Derby; and Edward Courteney, earl of Devonshire. At the coronation likewise appeared a new institution, which the king had established for personal security as well as pomp; a band of fifty archers, who were denominated Yeomen of the Guard. But, lest the people should take umbrage at this step, as if it implied a diffidence of his subjects, he declared the institution to be perpetual. The ceremony of the coronation was performed by cardinal Bourchier, archbishop of Canterbury. On the 18th of January, 1486, he married the princess Elizabeth; an occurrence celebrated in London with greater appearance of joy than either his entry or his coronation had been. Henry remarked, with displeasure, this general favor borne to the house of York; and the suspicions arising from it, not only disturbed his tranquillity during the whole of his reign, but produced a disgust toward his consort, and poisoned his domestic happiness. A long course of civil wars had rendered the people turbulent and factious; and the king's violent animosity to the house of York, irritated their proneness to rebellion. Early in his reign, instead of endeavouring to conciliate the affections of the opposite party, he always strove to quell them by absolute force. For this purpose, soon after his accession, he passed into the north of England, where the Yorkists were very numerous. In his journey thither, he received intelligence of an insurrection raised against him by lord Lovel and Sir Henry and Sir Thomas Stafford, who were marching to besiege the city of Worcester. The rebels dispersed, however, on the offer of a general pardon; and lord Lovel submitted to the king's mercy. The Staffords took sanctuary in the church of Colnham, near Abingdon; but it was found, or asserted, that it had not the privilege of protecting rebels. The elder was therefore brought out, and executed at Tyburn; but the younger, pleading that he had been misled, received a pardon. This success was soon after followed by the birth of a prince; whom Henry named after the celebrated king Arthur, said to have been the direct ancestor of the house of Tudor. None of these occurrences, however, seemed fully to reconcile the hearts of the English to their sovereign. His extreme severity still continued towards the house of York: many of its popular adherents had been treated with great cruelty, and deprived of their fortunes under pretence of treason; a general resumption had likewise been made of the grants made by the princes of that house. It was likewise universally believed that the queen herself met with harsh treatment. Hence, notwithstanding the politic and vigorous administration of Henry, the people generally made little scruple of openly expressing their disapprobation of his conduct and government; and one rebellion seemed to be extinguished only to give birth to another. At the commencement of his reign, the king had confined the duke of Clarence's son, as has been mentioned. This unfortunate youth, who was generally recognised as the earl of Warwick, was, through long confinement, entirely unacquainted with the affairs of the world. But he was now made use of to disturb the public tranquillity. The queen dowager was, with much reason, suspected to be at the bottom of this conspiracy; but not choosing to interfere openly in it, she employed one Simon, a priest of Oxford, to prosecute her designs. Having found a lad about fifteen years of age, named Lambert Simnel, who, from his graceful air and appearance, seemed capable of personating a man of quality, he instructed him to assume the title of Richard duke of York, second son of Edward IV., who, it was said, had secretly made his escape from the cruelty of his uncle. Hearing afterwards a new report that Warwick had escaped from the

Tower, and observing that this news was received with general satisfaction, he changed his plan of imposture, it is said, and made Simnel personate that unfortunate prince. This pliant and able youth was, therefore, found to speak familiarly of many occurrences, as happening to him in the court of Edward. But as the imposition was not calculated to bear a close scrutiny, he was removed to Ireland; and no sooner presented himself to the earl of Kildare the deputy, claiming his protection as the unfortunate earl of Warwick, than he is said to have shaken the loyalty of that nobleman, who, with several others, began to consult as to their line of duty, and expressed a strong belief in Simnel's story. In proportion as it was spread it obtained credit. Simnel was lodged in the castle of Dublin; the inhabitants universally took an oath of allegiance to him, as the true descendant of the Plantagenets; he was crowned with a diadem taken from the statue of the blessed virgin, and proclaimed king by the title of Edward VI.: the whole kingdom followed the example of the capital. This event so much alarmed Henry, that he would have gone over to Ireland to quell the rebellion, had he not been afraid of the machinations of the queen dowager in his absence. He was therefore resolved to confine her for life in a monastery: under pretence, however, of its being on account of her having formerly delivered up the princess her daughter to king Richard. The queen murmured against this treatment of her mother in vain: the king persisted in his resolution, and she remained in confinement till the time of her death, which happened some years after. The next measure was to show Warwick to the people. He was taken from the Tower, and led through the principal streets of London; after which he was conducted in solemn procession to St. Paul's, where great numbers were assembled to see him. Still, however, they proceeded in Dublin to honor their pretended monarch; and he was crowned with great solemnity in the presence of the earl of Kildare, the chancellor, and the other officers of state. At last, being furnished by the duchess of Burgundy with a body of 2000 veteran Germans under the command of Martin Swart, a brave and experienced officer, he proceeded to invade England. Landing in Lancashire, he marched thence to York, expecting that, as in Ireland, the people would rise and join him every where. But, in this he was deceived: they were unwilling to connect themselves with a body of foreigners; and were besides kept in awe by the reputation of Henry. Lord Lincoln, therefore, who commanded the rebel army, determined to bring the matter to a speedy issue. Accordingly he met the royal army at Stoke, in the county of Nottingham. An obstinate engagement ensued, but the royal forces obtained a complete victory. Lord Lincoln, with 4000 private men, fell in the battle; and Simnel with his tutor Simon were taken prisoners. The latter, being a priest, could not be tried by the civil power, and was only committed to close confinement. Simnel was pardoned, and made a scullion in the king's kitchen, whence he was afterwards advanced to the rank of falconer, in which employment he died. Henry being now freed from danger, determined to take ample vengeance on his enemies. For this purpose he took a second journey into the north; where finding many delinquents, he exacted heavy fines from all who could pay them; levying them, as well as inflicting capital punishment, not by the ordinary judges, but either by commissioners appointed for the occasion, or by sentence of a court-martial. Having thus re-established his authority, he determined to recommend himself to his subjects by affecting a military disposition. He seems, however, never to have had an intention of prosecuting foreign conquests; though, to please the people, he frequently gave out that he intended to invade France, and recover the continental possessions of England. Under these pretences, particularly that of assisting the Bretons, whom the king of France had lately subdued, and who had applied to him for relief, he persuaded his parliament to grant him a considerable supply. The counties of Durham and York, who had always been discontented with Henry's government, and still farther provoked by the oppressions under which they labored after the extinction of Simnel's rebellion, opposed the commissioners sent by the king to levy the taxes. When the latter applied to the earl of Northumberland for assistance in the execution of their office, instead of being able to enforce the levying of the tax, he himself was attacked and put to death by the insurgents. This act of violence committed by themselves, seemed to render the insurgents desperate, so that they now prepared openly to resist the royal power, under the conduct of Sir John Egremond. This ill-conducted and precipitate scheme, however, met with no success. Henry instantly levied a considerable force, which he committed to the charge of the earl of Surrey; by whom the rebels were quickly defeated. Sir John Egremond fled to the duchess of Burgundy, who protected him. The Bretons now urgently applied to Henry for assistance, their distresses becoming every day more galling, and as he had obtained the subsidy under the pretext of invading France, he found himself obliged to attempt something. With this view he set sail for Calais with an army of 25,000 foot and 1600 horse, of which he gave the command to the duke of Bedford and the earl of Oxford. Negociations for peace were even now, however, secretly begun, and commissioners were appointed to consider the terms, it is said, three months before Henry set out for the continent. As the love of money was his ruling passion, and the possession of Bretagne was a great object to France, an accommodation soon took place between the parties. The king of France engaged to pay Henry £200,000 as a reimbursement for the expenses of his expedition, and stipulated at last, to pay him and his heirs an annual pension of 25,000 crowns more. The authority of Henry now seemed so firmly established, as to leave no reason to dread any rival; but the duchess of Burgundy, resenting the depression of her family, and exasperated by her repeated disappointments, resolved to make a final effort against him. For this purpose, she had recourse to the same kind of expedient that had succeeded so well in Simnel's case. She propagated a re-

port that her nephew Richard Plantagenet, duke of York, had escaped from the Tower, where his elder brother was murdered, and that he still lay somewhere concealed. Finding this well received, she soon found a young man who assumed his name and character. This person was the son of one Osbeck, or Warbeck, a converted Jew, who had been in England during the reign of Edward IV. His name was Peter; but it had been corrupted after the Flemish manner into Peterkin, or Perkin. It was by some believed, that Edward, among his amorous adventures, had an intrigue with Warbeck's wife, which might account for the great similarity of features between Perkin and that monarch: for such there certainly was. The duchess of Burgundy is said to have found this youth well suited to her purposes. His graceful air, easy manners, and elegant conversation, rewarded her lessons, and were capable of imposing upon any but those who were privy to the imposture. The kingdom of Ireland was selected, as in the former imposture, for Perkin's first appearance. He landed at Cork, under the name of Richard Plantagenet, and was soon followed by the credulous multitude. He wrote letters to the earls of Desmond and Kildare, to join him; and dispersing every where the intelligence of his escape from his uncle Richard's cruelty, soon became an object of the public favor. Those who were disgusted with the measures of the king, were of course prepared to join Perkin, amongst whom were many of Henry's favorites, who had contributed to place him on the throne. All their attempts, however, were frustrated by the vigilance of the king, and most of the conspirators of any note were taken and executed. Perkin finding it in vain to attempt any thing in England, went to the court of James IV. in Scotland. Here he was received with cordiality, and that prince exhibited his confidence in his pretensions so far, that he gave him in marriage lady Catherine Gordon, daughter to the earl of Huntley, and a near relation of his own. But he in vain attempted to support his claims to the throne of England, and on the conclusion of peace between the two kingdoms, Perkin was obliged to leave Scotland. He now went to Flanders; and meeting with but a cool reception resolved to make an effort on the disposition of the people of Cornwall, who had lately risen on account of a new tax. On his first appearance, he was joined by about 3000 men, with whom he laid siege to Exeter. Henry, however, having marched against him with a considerable army, Perkin's heart failed him, though his followers now amounted to 7000, and he took shelter in a monastery. His wife fell into the conqueror's hands; who placed her in a respectable situation near the queen's person, which she enjoyed till her death. Perkin being persuaded to deliver himself into Henry's hands, was compelled to sign a confession of his imposition and history; but this was so defective and contradictory, that little regard was paid to it. His life was granted him; but he was detained in custody, and keepers were appointed to watch his conduct. From these, however, he at length broke loose; and flying to the sanctuary of Sheen, put himself into the prior's hands. Here he was again prevailed upon to deliver himself up to the king, and was committed to the tower, where engaging in a correspondence with the earl of Warwick for their joint escape, both of them were condemned and executed.

The arguments most favorable to the claim of Warbeck are thus brought into view by Dr. Lingard. '1. He was acknowledged as duke of York by Charles of France, by James of Scotland, and by Margaret of Burgundy. If it be said that the object of Charles was to distress Henry, James, at least, ought to have been convinced of the real character of Warbeck, before he would give him his kinswoman in marriage: and the conduct of Margaret, who was less liable to be deceived, must prove, that he was really her nephew, or that she knowingly promoted an imposture. But in the latter supposition what could be her object? Her niece was queen of England, and the children of that niece were presumptive heirs to the crown. Would she attempt to disinherit her own family, in favor of an unknown and obscure adventurer?

'2. Henry, with all his arts and intrigues, could never form a plausible account of the origin and adventures of Warbeck. The stories circulated with his connivance bear evident marks of uncertainty and falsehood. There were two methods by which he might have successfully detected the imposture. He might have ascertained the death of the princes in the tower by the apprehension and examination of the reputed assassins: or after the surrender of Warbeck, he might have confronted him with his own queen and her sisters. Their testimony would have decided the question. If then he adopted neither of these measures, it is an argument that he dared not. He must have known that both of the brothers were not put to death by their uncle, and that the younger had escaped, and now claimed the crown. Such, in short, are the arguments of those who maintain the cause of the adventurer.

'To me, however,' says this writer, 'the arguments against the identity of Warbeck with Richard, duke of York, appear greatly to preponderate. 1. From the preceding pages it has been seen that the death of the two princes was believed by all those who were most interested to know the truth, by their mother Elizabeth, and their uncle Richard, by the partisans of the house of Lancaster, and those of the house of York and even by Henry himself, as late at least as the summer of 1487, when he offered to marry their mother to the king of Scots, and their two sisters to his two sons. Four years later, a young man appears in Ireland, and professes to be the younger of the two princes, who were believed to be dead. Was it not incumbent on him to prove his pretensions, to show how he had escaped from the murderers, to what place he had been conveyed, and where and how he had spent the eight years which had elapsed since his supposed death? yet all this was kept a profound secret. Even in his proclamation at the head of the Scottish army, when it was so much for his interest that the English should be convinced of his claim, he contents himself with asserting, that in his tender age he had escaped by God's great

might out of the tower of London, had been secretly conveyed over sea to other divers countries, and had remained there certain years as unknown.' Does not this meagre account, in circumstances when the clearest proofs were required, betray a secret consciousness that his history would not bear investigation?

'2. His assertions seem to have been generally disbelieved by the nation. The persons who adhered to him in France, were most, if not all of them outlaws: and the gentlemen who were attainted on his account in England, seem to have suffered, not so much for having admitted his pretensions, as for their attempts to ascertain who he was, which Henry ascribed to a treasonable disaffection towards himself. After that period no person of note attached himself to the pretender. When he landed on the coast of Kent, he was immediately repulsed; when he entered England successively at the head of a Scottish army, and was in a condition to protect his friends, not an individual repaired to his standard; and when he afterwards assumed the command of the Cornish insurgents, he did not debauch a single gentleman from his allegiance to Henry. It is not credible that the numerous partisans of the house of York would have remained quiet on all these occasions, unless they had reason to believe him an impostor.

'3. This is strongly corroborated by the conduct of Henry. Would his jealousy have spared the real duke of York, when he had him once in his power? Would he have exhibited him to the gaze of the populace on the road, or of the citizens of London, of whom many could have recognised his features? Would he have suffered him to roam at liberty through the palace at Westminster for six months, exposed to the daily view of the queen, her sisters, and the principal nobility? After his flight and recapture, would not the king have gladly employed that plausible pretext for getting rid of so dangerous a competitor? Whoever compares his conduct to the earl of Warwick with his conduct to Warbeck, will be convinced that as he knew the former to be a real Plantagenet, so he believed the latter to be no other than an impostor.

'4. But how are we to account for the acknowledgment of his claim by foreign powers? It may be observed that, if the union of the two roses by the marriage of Henry and Elizabeth, had satisfied many of the Yorkists, there still existed a party, which through enmity to the house of Lancaster, sought to raise to the throne the young earl of Warwick. At its head was the duchess of Burgundy. She first patronised the imposture of Simnel, afterwards that of Warbeck. If either had succeeded, there would have been little difficulty in removing the phantom, to make place for the reality. The conduct of Charles VIII. proves nothing more than his wish to distress and intimidate Henry. He had previously attempted to raise the friends of Warwick: when that failed, Warbeck, probably at his instigation, solicited the aid of the Yorkists in Ireland; and, on their refusal, was invited to the French court as heir to the English crown. But the event proved that this invitation had no other object than to induce Henry to sign the treaty. From the moment that was accomplished Perkin received no countenance from the king of France. With respect to the king of Scotland, there seems to have been much also of policy in the reception which he gave to the adventurer. It was argued, that if Perkin were successful, he could refuse nothing to the prince who had placed him on the throne; that if he were not, Henry would still make advantageous offers to James, to detach him from the cause of his rival. On this account, says Polydore, the king, whether it were through error and pity, or only through dissimulation, began to show him great honor, &c., p. 597. The consideration of these circumstances has left little doubt on my mind that Warbeck was an impostor.'

To Henry VII. much of the modern civilisation of the English nation, is said to be owing. He throughout his reign strenuously endeavoured to depress the nobility and clergy, and to exalt and humanise the people. In the feudal times, every nobleman was possessed of a certain number of vassals, over whom he had, by various methods, acquired an almost absolute power; and, therefore, upon every slight disgust, he was able to influence them to join him in a revolt. Henry considered, that the giving of his barons a power to sell their estates, which were before unalienable, must greatly weaken their interest. This liberty, therefore, he gave them; and it proved highly pleasing to the commons. His next scheme was to prevent their giving liveries to many hundreds of their dependents, who were thus kept like the soldiers of a standing army to be ready at the command of their lord. By an act passed in this reign, none but menial servants were allowed to wear a livery; and this law was enforced under severe penalties. With the clergy, Henry was not so successful. The number of criminals of all kinds who found protection in monasteries and other places appointed for religious worship, seemed to indicate little less than an absolute toleration of all vice. Henry used his interest with the pope to get these sanctuaries abolished, but to no purpose. All that he could procure was, that if thieves, murderers, or robbers, registered as sanctuary men should sally out and commit fresh offences, and retreat, in such cases they might be taken out of the sanctuary, and delivered up to justice. In 1500, the king's eldest son Arthur was married to the Infanta Catharine of Spain, which marriage had been projected and negociated seven years. But the prince dying in a few months, the princess contracted a second marriage with his younger brother Henry, who was created prince of Wales. Henry himself is said to have made all the opposition to this arrangement of which a youth of twelve years of age was capable; but as the king persisted in his resolution, the marriage was eventually solemnised under a dispensation from the pope. In the latter part of the king's reign, his economy degenerated into avarice. His two ministers Empson and Dudley, perfectly qualified to second his avaricious views, committed to prison by indictment all persons whom they intended to oppress; and they seldom obtained their freedom but by paying heavy fines, which

were called mitigations and compositions. By degrees the very forms of law were omitted; and the property of his subjects, confiscated in the most arbitary and open manner, was transferred to the royal treasury.—Henry VII. died of the gout in his stomach, A.D. 1509, having lived fifty-two years, and reigned twenty-three. In his reign was built the celebrated vessel, called the Great Harry, which cost £14,000. This was properly speaking, the first ship of the royal navy. Before this period, when the king wanted a fleet, his expedient was to hire the vessels of the merchants.

Henry VIII. ascended the throne when he was about eighteen years of age, under almost every advantage which a prince could possess. He had a well-stored treasury, an undisputed title, and was at peace with all the powers of Europe. Commerce and arts had been some time introduced into England, where they met with a favorable reception. The young prince himself was of elegant person and manners, expert in all the accomplishments and martial exercises of the day; and beloved by all his subjects. He was also an adept in divinity we are told, at the age of seventeen. These advantages, however, seemed to have been united with a most capricious and tyrannical disposition; and however fortunate some of his measures proved, it is impossible that his general motives or the means to which he could resort to accomplish his purposes, can be approved by any good man. One of his first and best acts was to punish Empson and Dudley, who were obnoxious to the people, as instruments of the late king's rapacity. As they could not be impeached merely for executing the will of the king, they were accused of having entered into a treasonable conspiracy to seize by force the administration of government; and though nothing could be more improbable, the general prejudice against them was so great, that they were both condemned and executed. In 1510 Henry entered into a league with pope Julius II. and Ferdinand, king of Spain, against Louis XII. of France. In this alliance Henry was the only disinterested person. He promised himself nothing but the glory which he hoped would attend his arms, and the title of Most Christian King, which the pope assured him should be transferred to him from the king of France. The pope was desirous of wresting from Louis some valuable provinces which he possessed in Italy, and Ferdinand was anxious for a share in the spoil. Henry, on summoning his parliament, proclaimed his determination to annex the kingdom of France to the crown of England; and was readily furnished with large supplies. It was in vain that one of his more prudent counsellors objected, that conquests on the continent would only drain the kingdom without enriching it; and that England from its situation, was not fitted to enjoy extensive empire. The young king, deaf to all remonstrances, and hurried away by his military ardor, resolved immediately to begin the war. But after several attempts, which were rendered unsuccessful by the mismanagement of those who conducted them, a peace with France was concluded on the 7th August, 1514. Henry's arms were more fortunate in Scotland, where James IV. with the greatest part of the Scots nobility, and 10,000 men, were cut off in the battle of Flowden. See SCOTLAND. Henry in the mean time, elevated with his success, continued to lavish his treasures in pleasure, and in further expensive preparations for war. The ministers originally selected for him by his father were now disregarded; and his confidence was engrossed by Thomas, afterwards Cardinal Wolsey, who aided and flattered him in all his favorite pursuits. See WOLSEY. The king having soon exhausted the treasures left him by his father, as well as the supplies which he could obtain from his parliament, consulted with Wolsey upon new methods of replenishing his coffers. This minister's first scheme was to obtain a large sum from the people under the title of benevolence; though no title could be more improperly applied as it was not granted without the greatest murmurings and complaints. Having exacted also a considerable sum from the clergy, Wolsey further applied to the house of commons; but they only granted half the money he demanded. The minister highly offended, desired to be heard in the house, but they replied, that none could be permitted to sit and argue there, except their own members. Soon after, the king having occasion for new supplies, attempted, by Wolsey's advice, to procure them by his prerogative alone, and issued out commissions to all the counties of England for levying 4*s*. in the pound from the clergy, and 3*s*. 4*d*. from the laity. This stretch of power was soon opposed, and a general insurrection threatened the royal authority. Henry endeavoured to pacify the people by circular letters; in which he declared, that what he demanded was only by way of benevolence. The city of London, however, still hesitated, and in some parts of the country open resistance was manifested. This was at last suppressed by the duke of Suffolk; but Wolsey was blamed by both the king and council for his precipitate advice. To reinstate himself in the king's favor, Wolsey made him a present of the noble edifice of White Hall, then called York Palace, at Westminster, assuring him, that from the first he had intended it for the king's use. In order to have a pretext for amassing further wealth, Wolsey next undertook to found two new colleges at Oxford; and for this purpose received every day fresh grants from the pope and the king. The former gave him liberty to suppress several monasteries, and make use of their revenues for the erection of his new edifices; which proved a fatal precedent for the pontiff's interests, as it taught the king to seize on the monastic revenues whenever he stood in need of money. Wolsey now continued for a considerable time to enjoy the king's unlimited confidence; and as no monarch was ever more despotic than Henry VIII., no minister was ever more powerful than this churchman. His extraordinary elevation, served only to render his speedy fall the more conspicuous. He had long indeed known the king's capricious temper; but like most other royal favorites imagined himself unusually secure. The cause of his overthrow was connected with the question of the king'

divorce, and the dawning change in the religion of the country. The doctrines of the Reformation propagated by Luther in 1517, had gained considerable ground in England, and many professed a belief in them, notwithstanding the severe persecution which had been carried on against heretics. The clergy had become so exceedingly corrupt, and were immersed in such ignorance, that they were universally hated even by their own party, while no regard at all was paid to their decisions, or rather they were looked upon with the utmost abhorrence, by the reformers. Even the papal authority, though still very great, had within the last ten years declined very sensibly The marriage of Henry with his late brother's wife, was a transaction which all the religionists of the day agreed unequivocally to censure; and as it was only sanctioned from the first by a dispensation from the pope, it had been frequently objected to on public occasions. The states of Castile are said to have opposed a marriage betwixt the emperor Charles and the English princess Mary, Henry's daughter, urging, among other things, the illegitimacy of her birth. The same objection afterwards occurred on opening a negociation with France for a marriage with the duke of Orleans. Nor were these Henry's only motives. The queen was six years older than himself, her personal charms were decayed, and his affection lessened. All her children had died in infancy except the princess Mary; and Henry was, or pretended to be, greatly affected with this. Another point of the utmost importance was the succession to the crown, which any question concerning the legitimacy of the king's marriage would involve in confusion; and the king of Scotland would step in as the next heir. But above all, Henry was influenced by a passion he now entertained for Anne Boleyn, a maid of honor to the queen. See BOLEYN. In this station Henry had frequent opportunities of seeing her, and finding her virtue inflexible, he was obstinately bent upon the divorce. He now, therefore, sent his secretary to Rome to obtain from Clement VII. a bull for dissolving his marriage with Catharine. That he might not seem to entertain any doubt of the pope's prerogative, he insisted only on some grounds of nullity in the bull granted by Julius II. for the accomplishment of the marriage. In the preamble to this bull, it had been said, that it was granted only upon the solicitation of Henry; though it was known that he was then a youth under twelve years of age: it was likewise asserted, that the bull was necessary for maintaining the peace between the two crowns; though it is certain that there was no appearance of a quarrel between them. These false premises seemed to afford a good pretence for dissolving it; but, as the affairs of Europe then stood, the pope was involved in the utmost perplexity. Queen Catharine was aunt to the emperor, who had lately made Clement himself a prisoner, and whose resentment he still dreaded: besides, he could not, with any degree of prudence, declare the bull of the former pope illicit, as this would give a mortal blow to the doctrine of papal infallibility. On the other hand, Henry was his protector and friend; the dominions of England were the chief resource from whence his finances were supplied; and the king of France, some time before, had obtained a bull of divorce in circumstances nearly similar. In this exigence he endeavoured to spin out the affair by negociation; and, in the mean time, sent over a commission to Wolsey, in conjunction with the archbishop of Canterbury, or any other English prelate, to examine the validity of the king's marriage, and of the former dispensation; granting them also a provisional dispensation for his marriage with any other person. When the pope's message was laid before the English council, they considered that the advice and authority thus given by the pope might easily be hereafter disavowed; and that a clandestine marriage would totally invalidate the legitimacy of any issue from it which the king might have. Fresh messengers in consequence were dispatched to Rome, and evasive answers returned; the pope not imagining that Henry's passion would last through the course of a tedious ecclesiastical controversy. But in this he was mistaken. The king, in the first place, had been taught to dispute as well as the pope, and valued himself greatly on his knowledge of theology; to his arguments, secondly, he felt the power of adding threats, telling his followers that the English were too well disposed to withdraw from the holy see; and that if he continued uncomplying, the whole kingdom, with himself, would be disposed to deny obedience to a pontiff that had treated him with falsehood and duplicity. The king is said even to have asked his holiness, whether, if he were not permitted to divorce his present queen, he might not have a dispensation for having two wives! Perceiving Henry's eagerness, the pontiff at length sent his cardinal legate Campegio, to London; who, with Wolsey, opened a court for trying the legitimacy of the king's marriage with Catharine, and cited the king and queen before them. The trial commenced the 31st May, 1529; and both parties presented themselves. The king answered to his name when called: but the queen, instead of answering to hers, rose from her seat, and, throwing herself at the king's feet, made a very pathetic harangue; which her dignity, her virtue, and misfortunes, rendered still more affecting. She told her husband, 'That she was a stranger in his dominions, without protection, without council, and without assistance; exposed to all the injustice which her enemies were pleased to impose upon her: that she had quitted her native country, without any other resource than her connexions with him and his family; and that, instead of suffering thence any violence or iniquity, she had been assured of having in them a safeguard against every misfortune: that she had been his wife during twenty years; and would here appeal to himself, whether her affectionate submission to his will had not merited other treatment than to be thus, after so long a time, thrown from him with indignity: that she was conscious, —he himself was assured—that her virgin honor was yet unstained when he received her into his bed; and that her connexion with his brother had been carried no farther than the mere ceremony of marriage: that their parents, the kings of England

and Spain, were esteemed the wisest princes of their time, and had, undoubtedly, acted by the best advice, when they formed the agreement for that marriage, which was now represented as so criminal and unnatural: and that she acquiesced in their judgment, and would not submit her cause to be tried by a court, whose dependence on her enemies was too visible, ever to allow her any hopes of obtaining from them an equitable or impartial decision.' Having thus spoken, the queen arose, and, making the king a low reverence, left the court; nor would she ever again appear in it. The legate having again summoned her, declared her, on her refusal, contumacious, and the trial proceeded. But when the business seemed to be nearly decided, Campegio, on some frivalous pretences, prorogued the court, and referred the cause to the see of Rome. Wolsey appeared, at this time, to be in the same dilemma with the pope. On the one hand, he was solicitous to gratify the king, who had distinguished him by so many marks of favor; on the other he feared to offend the pope, whose servant he more immediately was, and who likewise had power to punish his disobedience. By attempting to please each party, he fell under the displeasure of both; so that he was at last left without a friend. It is quite clear also that the cardinal had not the ordinary foresight of a statesman, in regard to the probable issue of these disputes. The king was displeased on account of his not entering into his cause with the warmth he thought he had reason to expect; Anne Boleyn imputed to him the disappointment of her hopes; while the queen and her friends expressed the greatest indignation against him, on account of the part he had openly taken in the divorce. While in this unhappy situation, the king sent him a message by the dukes of Norfolk and Suffolk, demanding the great seal: the cardinal refused to deliver it, till Henry wrote him a letter, on receipt of which it was instantly given up. It was bestowed on Sir Thomas More; a man who, with great literary talents, was possessed of integrity, capacity, and virtue of rare occurrence. Wolsey was now commanded to depart from York palace, which was seized by the king. All his furniture and plate were also seized, and he was directed to await the king's pleasure at Esher, a country seat which he possessed near Hampton. One disgrace followed another; he was thought too near the court in the county of Surry, and was ordered to return to his see: at last his fall was completed by a summons to London to answer a charge of high treason. This he at first refused to answer, as being a cardinal. However, being at length persuaded, he set out on his journey, but was taken ill, and died by the way, at Leicester. See Wolsey.

After the death of Wolsey, the king, by the advice of Cranmer, submitted the legality of his marriage to all the principal universities of Europe (see Cranmer), and made no scruple of assisting their deliberations by liberal gifts of money. To a subdeacon he is said to have given a crown, to a deacon two crowns, and to others in proportion to the importance of their influence or opinions. Being thus fortified by the opinions of the universities, and even of the Jewish rabbies (for them also he had consulted), Henry began to think he might safely oppose the pope on this or any question. He began by reviving in parliament an old law against the clergy, by which all those who had submitted to the authority of the pope's legate were condemned to severe penalties. The clergy, to conciliate the king's favor, were obliged to pay a fine of £118,000. A confession was likewise extorted from them, that the king, and not the pope, was the supreme head of the church and clergy of England. An act was soon after passed against levying the first fruits, or a year's rent of all the bishoprics that fell vacant. After this the king privately married Anne Boleyn, at White-hall; and, on her pregnancy becoming apparent, publicly owned her for his wife, and passed with her through London with extraordinary magnificence. The streets were strewed with flowers, the walls of the houses hung with tapestry, and an universal joy seemed to be diffused among the people. The unfortunate Catharine, perceiving all further opposition to be in vain, retired to Ampthill near Dunstable, and afterwards to Kimbolton Castle, where she died. Her marriage with Henry was finally pronounced invalid by the archbishop of Canterbury. The pope was no sooner informed of these proceedings, than he passed a sentence declaring Catharine to be the king's only lawful wife; requiring him to take her again, and denouncing censures against him in case of a refusal. But Henry, knowing that his subjects were entirely at his command, resolved to dare even a total separation from the see of Rome, In 1534 he was declared head of the church by parliament; the authority of the pope was abolished; all tributes formerly paid to the holy see were declared illegal; and the king was entrusted with the collation to all ecclesiastical benefices. The nation came into the king's measures with joy, and took an oath called the oath of supremacy. All the credit which the popes had maintained over England for ages was now at once overthrown; and none seemed to repine at the change, except those who were immediately interested by their dependence on the papacy. But though the king thus separated from the church of Rome, he by no means adhered to the doctrines of Luther, which had been lately published. He had written a book against this celebrated reformer, which the pope pretended greatly to admire; and honored king Henry, on its account, with the title of Defender of the Faith. This character he seemed to be determined to maintain, and therefore persecuted the reformers most violently. Many were burnt for denying the popish doctrines, while others were executed for maintaining the pope's supremacy. The courtiers knew not which side to take; both the new and old religions were equally persecuted; and as both parties equally courted the favor of the king, he was, by that means, enabled to assume a greater degree of absolute authority. As the monks had all along shown the greatest resistance to his ecclesiastical character, Henry resolved to deprive them at once of the power of injuring him. He accordingly empowered Cromwell, secretary of state, to send commissioners into the several counties of England to inspect the monasteries; and to report, with

rigorous exactness, the conduct of such as were found in them. This employment was readily undertaken by various creatures of the court; and they are said to have discovered astonishing disorders and depravity in many of the religious houses; entire convents are said to have been composed of women abandoned to lewdness; friars were accomplices in their crimes, pious frauds were every where committed to increase the devotion and liberality of the people; and cruel and inveterate factions were maintained between the inhabitants. Thus a general horror ... ..cited against these communities; and the ing, in 1536, suppressed the lesser monasteries 376 in number. Their revenues, computed at £32,000 a-year, were confiscated to the king; besides their plate and other goods, computed at £100,000 more. In 1538 the greater monasteries were also demolished. The better to reconcile the people to this great innovation, accounts were published of the detestable lives which the friars led in their convents. The relics also, and other objects of superstitious veneration, were now brought forth and became objects of derision to the reformers. See RELICS. On this occasion was demolished the noted shrine of Thomas à Becket, commonly called St. Thomas of Canterbury. See BECKET. The riches of it were inconceivable when broken down; the gold with which it was adorned, is stated to have filled two large chests that eight strong men could scarcely carry out of the church. The king, on the whole, suppressed 645 monasteries, of which twenty-eight had abbots who enjoyed a seat in parliament; with ninety colleges, 2374 chantries and free chapels, and 110 hospitals. The whole revenue of these establishments amounted to £161,100. The indignation excited at Rome, by such an uninterrupted course of sacrilege, may be easily imagined. In 1535 the king had executed bishop Fisher, who was created a cardinal while in prison, and Sir Thomas More, for denying his supremacy. When this was reported in Italy, numerous philippics were published, comparing the king of England to Caligula, Nero, Domitian, and the most wicked tyrants of antiquity. Clement VII. died about six months after he had threatened the king with a sentence of excommunication; and Paul III. who succeeded him, entertained some hopes of an accommodation. But Henry was now so much accustomed to domineering, that the quarrel was incurable. The execution of Fisher was considered so violent a measure, that at last the pope passed all his censures against the king, citing him and all his adherents to appear in Rome within ninety days to answer for their crimes. If they failed, he excommunicated them; deprived the king of his realm; subjected the kingdom to an interdict; declared his issue by Anne Boleyn illegitimate; dissolved all the leagues which any Catholic princes had made with him, and, giving his kingdom to any invader, commanded the nobility to take up arms against him. His subjects at large, in that case, he freed from all oaths of allegiance; cut off their commerce with foreign states; and declared it lawful for any one to seize and to make them slaves, or to convert their effects to his own use. But these censures were now rather passed than denounced openly. The pope delayed the publication of this bul[illegible] should find an agreement with England totally desperate, and till the emperor, who was then hard pressed by the Turks and Protestant princes of Germany, should be in a condition to carry the sentence into execution. But in 1538, when news arrived at Rome that Henry had suppressed the monasteries, the pope published this important bull. Libels were again dispersed in which he was compared to the most furious persecutors of antiquity: Henry, it was said, had declared war with the dead, whom the Pagans themselves had respected; was at open enmity with heaven; and had engaged in professed hostility with all the saints and angels. Above all, he was reproached with his resemblance to the emperor Julian, whom, it is said, he imitated in his apostasy and learning, though he fell short of him in his morals. But these terrible fulminations had now lost their effect. Henry had long ago denied the supremacy of the pope, and had appealed from him to a general council. Now however, when a general council was summoned at Mantua, he refused to be subject to it, because it was called by the pope, and lay entirely under the subjection of that spiritual usurper. He engaged his clergy also to make a declaration to this purpose, and prescribed to them many alterations with regard to their ancient tenets and practises. It was expected that his opposition to the church of Rome would have made him finally fall in with the doctrines of the reformed; but though he had been gradually changing the theological system in which he was educated, he was as positive and dogmatical in the few articles he retained, as if the whole fabric had continued entire and unshaken; and though he stood alone in his opinion, the flattery of courtiers had so much inflamed his tyrannical arrogance, that he thought himself entitled to regulate by his own standard, the religious faith of the nation. The point on which he chiefly rested his orthodoxy was the most absurd in the whole schedule of popish doctrine, namely, that of transubstantiation. All departure from this he held to be a damnable error; and nothing, he thought, could be more honorable for him, than, while he broke off all connexion with the Roman pontiff, to maintain, in this essential article, the purity of the Catholic faith. In 1539 a parliament was called, which met on the 28th of April. The chancellor opened it by informing the house of lords, that it was the king's earnest desire to extirpate from his kingdom all diversity of opinions with regard to religion; and as this enterprise was difficult, he desired them to choose a committee from among themselves, who might frame certain articles, and communicate them afterwards to parliament. The lords named the vicar general Cromwell, now created a peer, the archbishops of Canterbury and York, the bishops of Durham, Carlisle, Worcester, Bath and Wells, Bangor and Ely. This committee itself, however, proved to be so agitated with diversity of opinions, that it could come to no conclusion. The duke of Norfolk then moved, that since there was no hope of having a report from the committee, the articles of faith proposed to be established should

be reduced to six, and a new committee be appointed to frame an act with regard to them. As this peer was understood to speak the king's mind, his motion was immediately complied with; and after a short prorogation, the bill of the six articles, or the bloody bill, as the protestants justly termed it, was introduced; and having passed the two houses, received the king's assent. By this law the doctrine of the real presence was established; the communion in one kind; the perpetual obligation of vows of chastity; the utility of private masses; the celibacy of the clergy; and the necessity of auricular confession. The denial of the real presence subjected the person to death by fire, and to the same forfeitures as are incurred in cases of treason. It even did not admit the privilege of abjuring; a cruelty unknown to the inquisition itself. The denial of any of the other articles, even though recanted, was punishable by the forfeiture of goods and chattels, and imprisonment during the king's pleasure: an obstinate a herence to error, or a relapse, was adjudged to be felony, and punishable by death. The marriage of priests was subjected to the same punishment. Their commerce with women was, for the first offence, forfeiture and imprisonment, and for the second, death. Abstaining from confession, and from receiving the eucharist at the accustomed times, subjected the person to fine, and to imprisonment during the king's pleasure; and if the criminal persevered after conviction, he was punishable by death and forfeiture. Commissioners were to be appointed by the king for inquiring into heresies and irregular practices; and the criminals were to be tried by jury. Parliament having thus surrendered all the ecclesiastical privileges of the nation, next proceeded to surrender their civil ones also. They gave to the king's proclamations the same force as to statutes enacted by parliament, and thus by one blow made a total subversion of the English constitution; and to render the matter if possible worse, they framed this law as if it were only declaratory, and intended to explain the natural extent of the royal authority. They afterwards pretended, indeed, to make some limitations to the regal power; and enacted, that no proclamation should deprive any person of his lawful possessions, liberties, inheritances, &c., nor yet infringe any common law or laudable custom of the realm. But this, after their late conduct, was mere verbiage.

As soon as the act of the six articles had passed, the Catholics were extremely vigilant to inform against offenders; and, in a short time, no fewer than 500 persons were thrown into prison, but some of the chief officers of state remonstrating against the cruelty of punishing a number of them, they were all set at liberty; and soon after this, Henry, as if he had resolved to give each party the advantage by turns, granted every family permission to possess a translation of the Bible, newly made. In 1540 the king again complained to parliament of the great diversity of religious tenets which prevailed among his subjects; a grievance, he affirmed, which ought the less to be endured, because the scriptures being now published in English, ought universally to be the standard of belief. But he had appointed, he said, some bishops and divines to draw up a list of tenets, and was determined Christ and the truth should have the victory; a result which he clearly seems to have expected more from the new book of his doctors, than from the publication of the scriptures. Cromwell, as vicar general, also made a speech in the upper house; and the peers in return told him, that he deserved to be vicar general to the universe. This year also the king suppressed the only religious order remaining in England, viz. the knights of Malta, or St. John of Jerusalem. This order had by their valor done great service to Christendom; and very courageously chastised the rising power of the Turks. During the general surrender of the religious houses in England, they refused to give up their noble revenues to the king; and Henry, who would endure no society that professed obedience to the pope, and felt, notwithstanding his late acquisitions, the need of fresh supplies, had recourse to parliament for their dissolution. He also now demanded a very considerable supply from the nation itself, through the parliament. The commons, however, were more lavish of the blood of their fellow-subjects, than of their money; and it was not without murmuring that the grant could be obtained. The king all this time continued to punish the protestants with unrelenting severity, for breaking the law of the six articles, and the papists who denied his supremacy; which gave occasion to a foreigner at the time to say, that those who were against the pope were burned, and that those who were for him were hanged. The king even seemed fond of displaying that tyrannical impartiality, which reduced both parties to subjection. He executed this year three protestants and three papists, tied together. The latter declared that the most grievous part of their punishment was the being coupled to such heretical miscreants as suffered with them. In 1542 Henry proceeded to the further dissolution of colleges, hospitals, and other foundations of that nature. The courtiers had been dealing with the presidents and governors to make a surrender of their revenues to the king, and had succeeded with eight. But there was an obstacle to their farther progress; it had been provided by the local statutes of most of these foundations, that no president, nor any fellows, could make such a deed without the unanimous consent of all the fellows. This consent would not have been easily obtained; but the parliament annulled these statutes, and the revenues of the houses were delivered over to the rapacity of the king. Henry also now extorted from several of the bishops a surrender of their chapter lands; by which means he pillaged the sees of Canterbury, York, and London, extensively. He engaged the parliament, however, to mitigate the penalties of the six articles, as far as regarded the marriage of priests, which was now only subjected to a forfeiture of goods, chattels and lands during life: but he was still bent on maintaining a rigid purity in speculative opinions. He had appointed a commission, consisting of two archbishops, and several bishops of both provinces, together with a considerable

number of doctors of divinity; and, by virtue of his ecclesiastical supremacy, had charged them to choose a religion for his people. Before the commissioners had made any progress in this undertaking, the parliament passed a law, by which they ratified all the tenets which these divines *should* establish with the king's consent. One clause of the new statute, however, seemed to savour somewhat of the spirit of liberty. It was enacted that the ecclesiastical commissioners should establish nothing repugnant to the laws and statutes of the realm. But in reality this proviso was inserted by the king, to serve his own purposes. By introducing confusion and contradiction into the laws, he became more entirely the master of every one's life and property; and as the ancient independence of the church still gave him jealousy, he was well pleased, under color of such a clause, to introduce appeals from the spiritual to the civil courts. For the same reason he would never promulgate a body of canon law; and encouraged the judges on all occasions to interpose in ecclesiastical causes, wherever they thought the law or the prerogative concerned. At last armed by the authority of parliament, or rather by their acknowledgment of his spiritual supremacy, the king's commissioners selected a system of tenets for the assent and belief of the nation. A small volume was first published, under the title of The Institution of a Christian Man, which was received by the convocation, and made the infallible standard of orthodoxy. In this book the points of justification, faith, free-will, good works, and grace, were discussed in a manner somewhat favorable to the opinions of the reformers; while the sacraments, which a few years before were only allowed to be three, were now increased to seven, conformably to the Catholic sentiments. Throughout the whole of this book the king's caprice is very discernible; and it may in reality be regarded as his composition. For Henry, while he made his opinion an universal rule, would himself submit to no authority whatever, not even to that which he had himself established. This same year the people had a farther instance of his inconsistency. He ordered a new book to be composed, called the Erudition of a Christian Man, and published it as a model of orthodoxy, without even asking the consent of the convocation. He was no less positive in his new creed than he had been in his old one; the only doctrine which he uniformly inculcated was that of passive obedience; and he expected the faith and practice of the nation to veer round regularly at his signal. But while the king was thus spreading his own books among the people, both he and the clergy seem to have been perplexed with regard to the scriptures. A review had been made by the ecclesiastical synod of the new translation of the Bible; and bishop Gardiner had proposed, that instead of employing English expressions throughout, several Latin words should still be preserved, because they contained, as he pretended, such peculiar energy and significance, that they had no correspondent term in English. Among these were ecclesia, penitentia, pontifex, contritus, &c. But as this mixture would appear extremely barbarous, and was evidently calculated for no other purpose than to retain the people in their ancient ignorance, the proposal was rejected. The knowledge of the people, however, seemed to be still more dangerous than their ignorance; and the king and parliament, soon after the publication of the scriptures, retracted the concession which they had formerly made, and prohibited all but gentlemen and merchants from perusing them. Even that liberty was not granted without an apparent hesitation, and dread of the consequences. These persons were allowed to read, 'so it be done quietly and with good order.' And the preamble to the act sets forth, 'That many seditious and ignorant persons had abused the liberty granted them of reading the Bible; and that great diversity of opinion, animosities, tumults, and schisms, had been occasioned by perverting the sense of the Scriptures.' The mass book also passed under examination; but little alteration was as yet made in it. Some doubtful or fictitious saints only were struck out, and the name of the pope was erased. The latter precaution was also used with every new book that was printed, and even every old one that was sold. The word *pope* was carefully omitted or blotted out; as if that precaution could abolish the term from the language, or cause the people to forget that such a person existed. About this time also, the king prohibited all plays and interludes ridiculing popery. In this tyrannical manner Henry proceeded with regard to ecclesiastical affairs. In other respects his conduct was equally violent. With regard to his domestic concerns, history scarcely affords his parallel. His affection for Anne Boleyn was carried to such a height, that he procured an act, excluding from the succession the issue of queen Catharine in favor of the children of Anne Boleyn; and they failing, of the king's other heirs. An oath acknowledging the legality of this new line of succession was enjoined, under penalty of imprisonment during the king's pleasure, and forfeiture of goods and chattels. All slander against the king and his new queen, or their issue, was subjected to the penalty of treason or misprision of treason. The unfortunate queen Catharine died at her retreat at Kimbolton, in 1536. On her death-bed she wrote a most pathetic letter to the king, in which she forgave him all the injuries she had received, and recommended to him in the strongest terms their daughter, the princess Mary. This letter affected Henry so much, that he could not read it without tears; but the new queen is said to have exulted on hearing of the death of her rival. Her triumph, however, was but short, Catharine died in January or February. Anne was delivered of a dead male child, a circumstance which seems much to have increased her capricious master's rising dissatisfaction with her. In her letters afterwards, written from the Tower, she states her knowledge of another 'affection' of his 'already settled,' and adverts to Henry's knowledge of her 'suspicion therein.' There was certainly also a levity of temper, and extreme gaiety of behaviour, about the young queen, which gave an opportunity to her enemies of inflaming the king's jealousy. After being satiated with the possession of he

for six years, perhaps Henry really doubted her fidelity; but his doubts were more probably confirmed by the beauty of Jane Seymour, with whom he had now fallen in love, and whom he married the day after the execution of Anne Boleyn. The guilt of the latter is among the historic doubts, which no research, perhaps, will now fully solve. Mr. Turner in his recent History of the reign of Henry VIII. seems to have held the balance upon the subject most impartially; and we cannot here do better than exhibit so fair a specimen of his work.

'Instead of a rhetorical vindication of Anne Boleyn,' says this writer, 'we will calmly collect such authentic circumstances as bear upon the accusation against her, which can now be explored, and leave their effect to the considera tion of the reader. She was accused of unchastity with her brother and four other persons. We may without undue partiality leave the incestuous imputation to such calumniators as Sanders and cardinal Allen, to believe and to enjoy. The greater and the more improbable the crime, the greater evidence common reason for common safety requires. But as no direct testimony of the commission of such an offence was in the present case adduced, we must in justice to the memory of the sufferers, discredit this allegation; unless we chuse to class ourselves amongst those common receivers and retailers of social scandal, to whom all ages have attached an unsparing and a wise contempt.

'On the charge of dishonorable intimacy with Mark Smeaton, who, like David Rizzio with the queen of Scotland, had been admitted as a musician to her society, there is the accusing testimony of his confession on his arraignment. In her conversation with Sir William Kingston, in the Tower, she asserted that he was never in her chamber, but at Winchester, where she had sent for him to play on the virginal; and that she had never spoken with him since, till the Saturday before her arrest, when she found him standing in the window of her presence chamber. Her further account admitted that he ventured to make that intimation of passion, which it is difficult to conceive that one so inferior could presume to utter to a queen, and to the wife of a man so formidable as Henry had now begun to be, without some intelligible encouragement. The offence with Norris she resolutely denied. It was suggested to him, that the king highly valued him, and would pardon him, if he acknowledged the criminality. He asserted her innocence, and was ordered for execution. It was first reported to her that he had confessed against her. Her exclamation on this account, rather implying a more than usual concern, was, 'O Norris! hast thou accused me? Thou art in the Tower with me, and thou and I shall die together!' But she described a conversation with him, that from a queen, with her husband alive, implies an indiscretion of which she herself could as little calculate the consequences, as be always certain to command them. That Norris was nourishing an improper liking for her, was even mentioned to herself by one of those accused, who could not have duly respected her, to have made such a mischievous observation to her own ear. Of Sir Francis Weston, she acknowledged that he had explicitly declared his love to her—a daring act of beginning treason in him to his queen, which it was dishonor in her not to have immediately punished — especially from a married man; and yet it was both forgiven and remembered; for she suffered him to continue in his courtly station. Nothing particular appears concerning Brereton.

'A bad woman, lady Rochfort, the wife of the accused brother, had in her suspicious jealousy reported those tales and surmises to the king, which brought destruction on her husband. Any assertion of a woman who was base enough to be procuring by it the ruin of the man she was united with, came so contaminated with its own wickedness, that no sound or honorable mind ought to have heard it without abhorrence of the utterer, and disbelief of her veracity. The more impressive communication was that of lady Wingfield in her last sickness to a confidential domestic. She had been in the queen's service, and was sworn to have mentioned that she had discovered her frailty; and some one imparted the disclosure to Henry.

'Such an overwhelming change could hardly occur to one whose bodily frame, from its very beauty, was and must have been delicate, without disordering effects. It brought hysterical affections upon her, which though unthinkingly characterised by some as levity, can only increase our sympathy for one so totally unbefriended, as to have no kind or soothing assistance near her, in a crisis that must have agitated, like an earthquake, the least exercised sensibility. The persons she most disliked were those whom too jealous power, too apt at these moments to be looking only for legal condemnation, appointed to attend her; as if even guilt ended all claims to commiseration or benevolence. She repeated during her confinement her asseverations of her innocence, though at times with some expressions which were not unequivocal. She was taken privately to Lambeth, to be examined again, as to the validity of her marriage; and it is stated, that she confessed some fresh and lawful impediments which are not explained, but on which Cranmer pronounced the nuptials to be void. This looks again like some attempt to save her life; but if it were so, some evil counsel intervened to avert the royal mercy. The fatal warrant for executing the legal sentence was issued. The archbishop was named by the king to be her confessor, and he visited her as such on the 16th of May. At that time the governor of the Tower had received no orders for her execution. The idea of her banishment was afloat. She then expected life, and said she was going to Antwerp. Two days afterwards appearances changed. Her death was sternly resolved, for reasons not disclosed, and her spirit gathered strength, as the certainty became fixed, and the time advanced. She collected all the force of her cultivated mind, and on the 19th of May ascended her scaffold in the Tower, with a pious intrepidity that suppressed every worldly wish or agitation, and made to the assembled company this unaffected speech: 'Good christian people! I am come hither to

die; for according to the law, and by the law I am judged to die; and therefore I will speak nothing against it. I am come hither to accuse no man, nor to speak any thing of that whereof I am accused and condemned to die. But I pray God save the king, and send him long to reign over you; for a gentler or more merciful prince was there never: and to me, he was ever a good, a gentle, and sovereign lord. And if any person will meddle with my cause, I require them to judge the best. And thus I take my leave of the world and of you all, and I heartily desire you all to pray for me. O Lord! have mercy upon me! To God I commend my soul.' These words she uttered with a smiling countenance; then kneeling down, with a fervent spirit, said, 'To Jesus Christ I commend my soul. Lord Jesu! receive my soul!' and repeating these words very often, suddenly the stroke of the sword terminated her earthly existence.

He adds afterwards, 'the mind that wishes to be impartial after reviewing all the circumstances that have reached us, will perhaps incline to think, that a state of academical neutrality as to her guilt, is preferable to either a belief or a denial of its existence; admitting at the same time that she may have been an instance of the justness of Ganganelli's remark, that the virtues in some persons are too often but like flashes of lightning, which shine and disappear in the horizon they illuminate. If Polydore Virgil believed her guilty, Melancthon hesitated to think so. That Smeaton should plead guilty; and that two grand juries of gentlemen of different counties should have seen evidence enough on one side to put the four individuals, who had no privilege of peerage, on their trials; that a common jury of another class of persons, on hearing the whole case, should have given their verdict of conviction on such an arraignment; and that the house of lords, the highest order of subjects in the nation should attaint her also on the same charge and circumstances, present such a concurrence of judgments upon oath and honor, of both the nobility, gentry, and others of the land, as to compel us, however unwilling, to hesitate before we can discredit what they united to think was sufficiently proved. But at the same time when we recollect on the other hand, the absence of such direct proof as would have satisfied bystanders, and precluded doubt; the improbability that she would have risked the forfeiture of such an exalted rank; the constancy of her previous virtue, during six years severe probation; the king's jealousy of his honor, and certain indignation; the peril of the crime; the continual probability of its detection; her searching examinations adding no discovery; her solemn denials; her exculpation by Norris; her courageous death; her general good conduct, and her public character; the balance fluctuates as we hold it; judgment pauses; and every honorable feeling seems to urge to leave the question in that charitable uncertainty with which time, accidents, and history have combined to involve it.'

Anne was beheaded by the executioner of Calais, who was reckoned more expert than any in England; and Henry married his beloved Jane Seymour. His satisfaction, however, was of no long continuance: for the queen becoming pregnant shortly after marriage, died in two days after the birth of the child; who being a son, was baptised by the name of Edward. As this lady had been as much beloved by Henry as any of his wives, his grief for her loss is said to have been considerable. However, it did not hinder him from entering very soon afterwards into a new matrimonial scheme; in which he met with many difficulties. He first made proposals to the duchess dowager of Milan, niece to the emperor and to Catharine his own former queen; but as he had behaved so ill to the aunt, it was not to be supposed that his addresses could prove agreeable to the niece. On this he demanded the duchess dowager of Longueville, daughter of the duke of Guise; but on making the proposal to the French monarch, Francis I. he was informed that the princess had been already betrothed to the king of Scotland. Negociations were afterwards entered into for a German match; and the princess of Cleves was proposed by Cromwell, on account of the great interest her father had with the Protestant princes. Henry had also become enamoured of her person from a picture of her he had seen; but this proved ultimately so flattering, that when the negociation was finished, and the bride arrived in England, Henry revolted at the match, and described her in his disappointment as a great Flanders mare, to whom he could never bear the smallest affection. The matter was still worse, when he found that she could speak no language but that of her own country, of which he was entirely ignorant. Notwithstanding these objections, however, he resolved to complete the marriage, telling Cromwell, that since he had gone so far he must now put his neck into the yoke. The fact was, that the friendship of the German princes was now more than ever necessary to Henry; and it was supposed, that the affront of sending the princess back might be resented. His aversion, however, soon increased, and he now determined to part both with his queen and prime minister. Cromwell had long been an object of aversion to the nobility, who hated him on account of his obscure birth. See CROMWELL. He had also fallen under the displeasure of both Protestants and Papists; the former hating him on account of his concurrence with Henry in their persecution, and the latter looking upon him as the greatest enemy of their religion. To these circumstances, was added the excitement of a new passion of Henry's, who had been smitten with Catharine Howard, niece to the duke of Norfolk. By the insinuations of this lady and her uncle, Cromwell's ruin was accomplished; and he was condemned without either trial or examination. His death was succeeded by the dissolution of the marriage with the princess of Cleves. The princess parted from him with great indifference: and accepted of £3000 a year as a compensation, but refused to return to her own country after the affront she had received. The king's marriage with Catharine Howard now followed, and the event may be regarded as a providential punishment upon this tyrant. His insinuations against the virtue of the unfortunate princess of

Cleves, were amply repaid by the actual infidelities of his new queen. So happy indeed did he imagine himself in this match, that he publicly returned thanks for his conjugal felicity, when information concerning the queen's incontinence was given to Cranmer by one Lascelles, whose sister had been servant to the duchess dowager of Norfolk. He described not only her disgraceful amours before marriage, but affirmed that she ever since had continued the same criminal practices. Two of her paramours were arrested, and confessed their crimes: the queen also confessed her guilt before marriage, but denied ever being false to the king's bed. She was beheaded on Tower-hill, along with the viscountess of Rocheford, who had been a confident in her amours, and who, as the principal instrument in the destruction of Anne Boleyn, died unpitied. To secure himself from any farther disasters of this kind, Henry now passed a most extraordinary law, enacting that any one who should know, or strongly suspect any guilt in the queen, might within twenty days, disclose it to the king or council, without incurring the penalty of any former law against defaming the queen; though at the same time every one was prohibited from spreading the matter abroad, or even privately whispering it to others. It was also enacted, that if the king married any woman, who had been incontinent, taking her for a true maid, she should be guilty of treason if she did not previously reveal her guilt to him. These laws afforded considerable diversion to the people, who now said that the king must look out for a widow; as no reputed maid would ever run the risk of incurring the penalty of the statute. This in truth happened to be the case; for about a year after the death of Catharine Howard, he married, for his sixth wife, Catharine Parr, widow of Nevil, lord Latimer. This lady being favorable to the doctrines of the reformation, and having the boldness to tell Henry her mind, is said to have hazarded her life by her zeal occasionally. The furious monarch, impatient at the least contradiction, complained to Gardiner, and others, of her freedom, and articles of impeachment were even drawn up against her. But these were rendered abortive by the prudence and address of the queen. See Parr. Henry all this time had tyrannised over his nobility in the most cruel manner. Irritated by the conduct of cardinal Pole, he had long confined the countess of Salisbury, his mother, and the last of the house of Plantagenet. She was now executed with circumstances of great barbarity. Confined without trial, when brought to the scaffold she refused to lay her head on the block, telling the executioner, that if he would have her head, he must win it in the best way he could: she then ran about the scaffold, pursued by the headsman who aimed many fruitless blows at her neck before he was able to put an end to her life. Soon after, lord Leonard Grey was likewise executed for treason. The last victims of the king's injustice and cruelty were the duke of Norfolk and his son, the earl of Surry. The former had served the king with fidelity, and the latter was a young man of the most promising hopes. His qualifications, however, were no security against the violence of Henry's temper. He had dropped some expressions of resentment against the king's ministers, who had displaced him from the government of Boulogne; and the whole family had become obnoxious to his displeasure, on account of the late queen. Orders were now therefore, given to arrest both the father and son. The duchess dowager of Richmond, Surry's own sister, was among the number of his accusers; and Sir Richard Southwell, his most intimate friend, charged him with infidelity to the king. Surry denied the charge, and challenged his accuser to single combat. This favor was denied him; and, notwithstanding his eloquent and spirited defence, he was condemned and executed on Tower-hill. The duke of Norfolk in vain endeavored to mollify the king by letters and submissions. An attainder was found against him, though the only crime his accusers could allege was, that he had once said that the king was sickly, and could not hold out long; and that the kingdom was likely to be torn between the contending parties of different persuasions. Cranmer, though engaged for many years in an opposite party to that of Norfolk, and though he had received many and great injuries from him, would not sanction this prosecution; but retired to his seat at Croydon. The death warrant, however, was made out and immediately sent to the lieutenant of the tower; but a period was put to the cruelties and violence of the king by his death, on the 14th January, 1547, the night before Norfolk was to have been executed.

Henry was succeeded by his son Edward, a boy of nine years of age. The most remarkable transactions of his reign are those which concern religion. The restraint which Henry VIII. had imposed upon the Protestant cause was now taken off; and the disciples of the new religion, as it was called, not only under the auspices of archbishop Cranmer, maintained their doctrines openly, but soon became the prevailing party. Henry had fixed the majority of his son at eighteen years of age; and in the mean time, appointed sixteen executors of his will, to whom, in the interim, he entrusted the government of the king and kingdom. This will he imagined would be obeyed as implicitly after his death as if he had been alive. But the first act of the executors was to choose the earl of Hertford, afterwards duke of Somerset, protector of the realm; in him was lodged all the regal power, together with the privilege of naming whom he pleased for his privy-council. The duke of Somerset had long been reckoned a secret partisan of the reformers; and immediately on his elevation to this dignity, began to reform the abuses of the ancient religion. Under his direction and that of Cranmer, therefore, the reformation was carried forward and completed. The only person of consequence who opposed this was Gardiner, bishop of Winchester; and, to the disgrace of their own principles, the reformers now showed that they could persecute as well as the papists. Gardiner was committed to the Fleet prison, where he was treated with great severity. He was afterwards sent to the tower; and having been confined there two years, was commanded to subscribe several articles, among which was one confessing

the justice of his own imprisonment. To all the articles but this, he agreed to subscribe; but that did not give satisfaction. He was then committed to close custody; his books and papers were seized; all company was denied him, and he was not even permitted the use of pen and ink. The bishops of Chichester, Worcester, and Exeter, were in like manner deprived of their offices; those of Landaff, Salisbury, and Coventry, only escaped by sacrificing the most considerable of their revenues. The libraries of Westminster and Oxford were ordered to be ransacked and purged of the Romish legends, missals, and other superstitious volumes; in which search, great devastation was made even in useful literature. Many volumes clasped in silver were destroyed for the sake of their rich bindings; many of geometry and astronomy were supposed to be magical, and destroyed on that account; while the members of the university, trembling for their own safety, in vain opposed themselves to these Vandal ravages. A commission was next granted to the primate and others, to search after all anabaptists, heretics, or contemners of the new liturgy. Among the numbers who were found guilty on this occasion was one Joan Boucher, commonly called Joan of Kent; who was so obstinate in pestilential errors that the commissioners could make no impression upon her. She maintained an abstruse metaphysical sentiment, that Christ, as man, was a sinful man; but, as the Word, he was free from sin, and could be subject to none of the frailties of the flesh with which he was clothed. For maintaining this doctrine she was condemned to be burnt as a heretic. The young king, who, it seems, had more humanity than his teachers, refused at first to sign the death-warrant: but at last, overcome by the importunities of Cranmer, he reluctantly complied; declaring, that if he did wrong, the sin should be on the head of those who had persuaded him to it. The primate, after making another unsuccessful effort to reclaim the woman from her opinions, committed her to the flames. Some time after, Van Paris, a Dutchman, was condemned to death for Arianism. He suffered with great intrepidity, and is said to have hugged the faggots that were consuming him. The rest of this reign affords only a history of intrigues and cabals. The protector was first opposed by his own brother admiral Sir Thomas Seymour, who had married Catharine Parr the late king's widow. She died soon after the marriage; and he then made his addresses to the princess Elizabeth, who is said not to have been averse to the match. His brother the duke, being informed of his ambitious projects, caused him to be attainted of high-treason, and at last condemned and executed. Somerset himself was sometime afterwards deprived of his office by Dudley, duke of Northumberland; and was in his turn accused of treason, and beheaded. Not satisfied with the office of protector, which he assumed on the death of Somerset, this ambitious nobleman formed a scheme of engrossing the sovereign power altogether. He represented to Edward, who was now in a declining state of health, that his sisters Mary and Elizabeth, who were appointed by Henry's will to succeed, in failure of direct heirs, to the crown, had both been declared illegitimate by parliament; that the queen of Scots his aunt stood excluded by the king's will; and being an alien also, lost all right of succeeding. The three princesses being thus excluded, the succession naturally devolved to the marchioness of Dorset, eldest daughter of the French queen, Henry's sister, who had married the earl of Suffolk after her first husband's death. The heir of this lady was lady Jane Grey, universally respected, both on account of the charms of her person, and the virtues and endowments of her mind. The king, who was accustomed to submit to the political views of this minister, agreed to have the succession submitted to his council, where Northumberland hoped to secure an easy concurrence. The judges, however, who were appointed to draw up the king's letters patent for this purpose, warmly objected to the measure, and gave their reasons. They begged that a parliament might be summoned, both to give it force, and to free its partisans from danger; they said that the form was invalid, and would not only subject the judges who drew it, but every counsellor who signed it, to the pains of treason. Northumberland could not brook their demurs; he threatened them with his authority, called one of them a traitor, and said he would fight with any man in his shirt in such a just cause as that of lady Jane's succession. A method was therefore found of screening the judges from danger, by granting them the king's pardon for what they should draw up; and at length the patent for changing the succession was completed, the princesses Mary and Elizabeth were set aside, and the crown settled on the heirs of the duchess of Suffolk; she herself being contented to forego her claim. For some time the king had languished in a consumption. After this settlement of the crown, his health visibly declined every day, and little hopes were entertained of his recovery. His physicians were now dismissed by an order of council; and he was put into the hands of an ignorant old woman, who undertook to restore him to health. After the use of her medicines, all his bad symptoms greatly increased. He felt a difficulty of speech and breathing; his pulse failed, his legs swelled, his color became livid. He expired at Greenwich, on the 6th of July, 1553, in the sixteenth of his age, and seventh of his reign.

After the death of Edward, very little regard was paid to the new patent by which lady Jane Grey had been declared heir to the throne. The undoubted title of Mary, notwithstanding the scandalous behaviour of her father and his servile parliaments, was generally acknowledged by the nation. Northumberland, however, was resolved to put the late king's will in execution. He therefore carefully concealed the death of the king, in hope of securing the person of Mary, who, by an order of council, had been required to attend her brother during his illness; but she, being informed of his death, immediately prepared to assert her rights. Northumberland then, accompanied by the duke of Suffolk, the earl of

Pembroke, and some other noblemen, saluted lady Jane Grey queen of England. She was with difficulty, however, brought into the measure of accepting the crown, and reluctantly suffered herself to be conveyed to the tower, where it was then usual for the sovereigns of England to pass some days after their accession. Mary, who had retired to Kenning-hall, in Norfolk, found herself, in a very few days, at the head of 40,000 men; and lady Jane, after an ineffectual attempt of her friends to raise a military force, resigned, in ten days, the sovereignty. Northumberland, finding his affairs desperate, attempted to quit the kingdom. But he was stopped by the band of pensioner guards; surrendered himself to Mary; and was, soon after, tried and executed for treason, with Sir John Gates and Sir Thomas Palmer, two of his political tools. Sentence was also pronounced against lady Jane Grey and her husband lord Guildford. Mary entered London July 31st, in company with her sister the princess Elizabeth, and was at once peaceably settled on the throne. Soon, however, her people found reason to repent their attachment to her. Though she had at first solemnly promised to defend the religion and laws of her predecessor, her authority no sooner became firmly established, than she resolved to restore the old religion. Gardiner, Bonner, and the other bishops who had been imprisoned or deprived during the last reign, were taken from prison and reinstated in their sees. On pretence of discouraging controversy, the queen, by her prerogative, silenced all preachers throughout England, except such as should obtain a particular license, and this she was resolved to give only to those of her own persuasion. The greater part of the foreign protestants left the kingdom. Soon after, the queen called a parliament, which seemed willing to concur in all her measures. They at once repealed the statutes with regard to religion, that had passed during the reign of Edward VI., and the national religion was placed on the footing on which it stood at the death of Henry VIII. To strengthen the cause of the catholics, and give the queen more power to establish the religion to which she was attached, a proper match was to be sought for her. Her affections were said to be engaged to Courtenay, earl of Devonshire; but he was thought to be attached to the princess Elizabeth, and received the attention of the queen with indifference. The next person proposed as a match for her was cardinal Pole; but he was now in the decline of life, and Mary declined to open any negociation on the subject. At last, Philip II. of Spain, son to the emperor Charles V., was considered eligible by the queen and her friends. He was then in the twenty-seventh year of his age: but when her intentions with regard to him became known, the greatest alarm took place throughout the nation, and the commons presented so strong a remonstrance against a foreign alliance, that the queen dissolved the parliament. To obviate clamor, however, the articles of marriage were drawn up with the most careful consideration of the interests of England. It was agreed, that though Philip should have the title of king, the administration should be entirely in the queen; that no foreigner should be capable of holding any office in the kingdom; nor should any innovation be made in the laws, customs, and privileges of the people: that Philip should not carry the queen abroad without her consent, or any of her children without the consent of the nobility. £60,000 a-year were to be settled upon her as a jointure; and the male issue of this marriage were to inherit Burgundy and the Low Countries as well as the crown of England: in case of the death of Don Carlos, Philip's son by his former marriage, without any heir, the queen's issue should inherit all the rest of the Spanish dominions also. It is but justice to Guardini, who drew these articles, to observe, that when Elizabeth afterwards contemplated a foreign marriage, she referred to this treaty as the most satisfactory precedent that could be found. All these concessions, however, were not sufficient to quiet the popular apprehensions: they were considered merely as words of course, which might be retracted at pleasure; and the whole nation murmured against a transaction which was considered dangerous to its independence. An insurrection was raised by Sir Thomas Wyatt, a Roman catholic, at the head of 4000 men, who marched out of Kent towards London, publishing a declaration against the Spanish match and the queen's evil counsellors. Having advanced as far as Southwark, he required that the queen should put the Tower of London into his hands; that she should deliver four counsellors as hostages; and, to ensure the liberty of the nation, should marry an Englishman. But his force was by far too small to support such demands; and he wasted so much time without attempting any thing of importance, that the popular ferment subsided, his men abandoned him gradually, and he was at last obliged to surrender himself. His followers were promptly brought to justice; fifty of the Londoners, who had joined the rebels, were hung in various parts of the metropolis; eight or ten suffered in Kent; 400 more were conducted with ropes about their necks into the queen's presence, and there received their pardon. Wyatt himself was condemned and executed. This rebellion had almost proved fatal to the princess Elizabeth, who for some time past had been treated with neglect: and a letter of advice to her was produced on the trial of Wyatt. An important letter written by her to the king of France (whose ambassador Noailles had warmly encouraged the late insurrection) was also placed in the hands of the queen; and Elizabeth seems at least to have wavered in her allegiance to her sister. Mary had never forgotten the quarrel between their mothers; and the declaration made after her own accession, recognizing Catharine's marriage as legal, necessarily pronounced Elizabeth illegitimate. She was likewise obnoxious on account of her religion, which Elizabeth at first had not prudence to conceal. She was now committed to the Tower, and underwent a strict examination before the council; but Wyatt declared her innocence on the scaffold, and, after a short confinement, the queen found herself under a necessity of releasing her. To get rid of so troublesome a

rival, however, she was offered in marriage to the duke of Savoy; and Elizabeth declining the proposal, she was committed close prisoner to Woodstock. The rebellion proved fatal to many persons of distinction. The Tower and prisons were filled with nobility and gentry, who became objects of royal vengeance on account of their credit and interest with the people. Sir Nicholas Throgmorton was tried in Guildhall; but as no satisfactory evidence appeared against him, the jury gave their verdict in his favor. The queen was so much enraged, that she re-committed him to the Tower, summoned the jury before the council, and at last sent them all to prison, fining them afterwards, some £1000, and others £2000 each. Sir John Throgmorton, brother to Sir Nicholas, was condemned and executed, upon evidence which had been already rejected as insufficient. But of all those who perished on this occasion, none excited such universal compassion as the unfortunate lady Jane Grey, and her husband, lord Guildford Dudley. They had already received sentence of death, and two days after the execution of Wyatt, orders were sent them to prepare for eternity. Lady Jane, who had long been in expectation of this, received the news with heroic resolution. The place intended at first for their execution was Tower-hill; but the council dreading the effects of the people's compassion for their youth, beauty, and innocence, ordered lady Jane to be beheaded within the Tower. The duke of Suffolk, whose ambition had been the cause of his daughter's unhappy fate, was soon after tried, condemned, and executed. Sir Thomas Grey also lost his life on the same account: but the cruel spirit of Mary was still unsatisfied; and to disable the people from further resistance, general musters were ordered, and commissioners seized their arms. Notwithstanding Mary's unpopularity, however, the rebellion of Wyatt so materially strengthened the hands of government at last, that a parliament was assembled, for the purpose of gratifying the queen's wishes in regard to her marriage with Philip. The emperor Charles V., to facilitate this object, sent over to England 400,000 crowns, to be distributed among the members in bribes and pensions; a practice of which there had hitherto been no example in England. The queen, notwithstanding her bigotry, now resumed the title of Supreme Head of the Church, which she had dropped three months before; and Gardiner made a speech, in which he proposed that they should invest her with a legal power to dispose of the crown, and appoint her successor. But the parliament, however obsequious in other respects, did not choose to gratify their sovereign in a measure by which the kingdom of England might become a province of the Spanish monarchy. They would not even declare it treason to imagine or attempt the death of the queen's husband during her life-time, though they agreed to ratify the articles of marriage: and, previous to his arrival, it was thought proper to dismiss both houses. Soon after this the marriage of Philip and Mary was solemnised; but as the former had espoused her merely with a view to become king of England, he no sooner found this an empty title, than he showed a total want of affection for the queen. He passed most of his time at a distance from her in the Low Countries; and seldom wrote to her except when he wanted money.

The enemies of the state being supposed to be suppressed, those of the Catholic faith were next persecuted, and the old sanguinary laws were revived. Orders were given that the priests and bishops who had married should be ejected; that the mass should be restored; the pope's authority re-established; and that the church and its privileges, all but their goods and estates, should be put on the same footing on which they were before the commencement of the Reformation. Several of the gentry and nobility, however, having already possessed themselves of the church lands, it was found inconvenient, and, indeed impossible, to make restoration of them. The persons who chiefly promoted these measures were Gardiner, bishop of Winchester, and cardinal Pole, a kinsman of Henry VIII., who had now returned from Italy. The latter was for tolerating the Protestants; but the former, perceiving that rigorous measures would be most agreeable to the king and queen, declared himself against it. That he might not, however, appear in person at the head of the persecution, he consigned that office to Bonner, bishop of London, a man of a sanguinary disposition. The bloody scene began by the execution of Hooper, bishop of Gloucester, and Rogers, prebendary of St. Paul's. These were quickly followed by others, of whom the principal were archbishop Cranmer, Ridley, bishop of London, and Latimer, bishop of Worcester. (See those articles.) These persecutions becoming at last odious to the nation, the perpetrators of them wished to throw the blame upon others. Philip endeavored to fasten the whole reproach upon Bonner; but that bishop retorted on the court. A bold step was now taken to introduce a court similar to the Spanish inquisition, that should be empowered to try heretics, and to condemn them by its own authority. But even this was thought a method too dilatory in the present exigence of affairs. A proclamation was issued against books of heresy, treason, and sedition, declaring, that whosoever had such books in his possession, and did not burn them without reading, should suffer as a rebel. This was attended with the execution of such numbers, that at last the magistrates, who had been instrumental in these cruelties, refused to give their assistance any longer. It was computed, that during this persecution, 277 persons suffered by fire, besides those punished by imprisonments, fines, and confiscations. Among those who were burnt were one archbishop, four bishops, twenty-one other clergymen, eight lay gentlemen, eighty-four tradesmen, 100 husbandmen, fifty-five women, and four children. The only remarkable transaction of this reign with regard to civil affairs was the loss of Calais, which had been in the possession of the English for upwards of 200 years. See Calais. This loss filled the whole kingdom with complaints, and the queen is said to have been excessively grieved at it. She was heard to say, that, when dead, the name of Calais would be found engraved on her heart. She died in 1558 of a

lingering illness, after a reign of five years, four months, and eleven days.

On the death of Mary, the princess Elizabeth succeeded without opposition. She was at Hatfield when news of her sister's death arrived; upon which she hastened to London, where she was received with unusual joy. Her qualifications for government were never exceeded in her own sex, and have been rarely equalled in the other. While her superior judgment led her to choose proper ministers, she ever exhibited authority enough to keep her subjects in awe. The restraints also to which she had been subjected during her sister's reign, had taught her so well to conceal her sentiments, that she had become a mistress of dissimulation; which, however it must qualify our moral estimate of her character, proved occasionally of great service to her government. She completed the reformation, and placed the religion of England upon the plan on which it at present subsists. This was accomplished with little difficulty; for the persecutions of Mary's reign had much increased the aversion of the people to popery. In the time of Edward VI. they had been compelled to embrace the protestant religion, and their fears induced them to conform; but almost the whole nation had now become protestants from choice. The reformation was confirmed by act of parliament in 1559; being the fourth change of the established religion in England in thirty-two years. While the queen and her counsellors were employed in settling the religious affairs of the nation, negociations were carried on for a peace between England and France: this was at last concluded on the following terms, viz. that Henry should restore Calais at the expiration of eight years; that in case of failure he should pay 500,000 crowns, and Elizabeth's title to Calais still remain; that for the payment of this sum he should find the security of eight foreign merchants, not natives of France; and until that security was prepared he should deliver five hostages. If during this interval Elizabeth should break the peace with France or Scotland, she should forfeit all title to Calais; but if Henry made war on Elizabeth, he should be obliged to restore the fortress immediately. This pacification was soon followed by an irreconcileable quarrel with Mary queen of Scots; a quarrel not extinguished but by the death of the Scottish princess; and connected with circumstances of treachery, hypocrisy, and dissimulation, on the part of Elizabeth, which stain her memory with indelible disgrace. See the articles MARY and SCOTLAND. Elizabeth having at last disposed of her rival, began in 1587 to make preparations for resisting a Spanish invasion, which was now threatened. Hearing that Philip was secretly fitting our a navy to attack her, she sent sir Francis Drake with a fleet to pillage his coasts and destroy his shipping. (See the article DRAKE). But though this retarded the intended invasion of England for a whole twelvemonth, it by no means induced Philip to abandon his design. During that interval he continued his preparations with the greatest assiduity, more especially as the invasion of England seemed to be a necessary preparative for regaining his authority over the Netherlands, the revolted provinces having been strongly supported by Elizabeth. The fleet prepared at this time was superior to any thing then existing in the world; and no doubt being entertained of its success, it was ostentatiously stiled the Invincible Armada. The miserable issue of this expedition, and the total failure of the mighty hopes of Philip, are related under the article ARMADA. The spirit and courage of the English were now excited to attempt invasions in their turn; which they executed in numerous descents on the Spanish coast. The frequent advantages they obtained by sea it would be tedious to relate; but they gradually formed the character, and laid the foundation of all the subsequent triumphs, of the British navy: it will suffice to observe, that the naval commanders of this reign are still considered as some of the boldest and most enterprising men England ever produced. Elizabeth reigned with increasing glory till 1603; but her personal passions and the government of her court became the sources of extreme misery to her for some time before her death. She had caused her favorite and lover, the earl of Essex, to be accused of high treason. See ESSEX. And though his execution could not be called unjust, the queen's affection after his death is said to have returned to such a degree, that she thenceforth gave herself entirely over to despair. She refused food and sustenance; continued silent and gloomy; and lay for ten days and nights upon a carpet, leaning on cushions. Her vexation was doubtless also increased by perceiving the attentions of her courtiers gradually transferred from herself to James her expected successor. Tormented with perpetual heat in her stomach, attended with unquenchable thirst, she drank without ceasing, but refused the assistance of her physicians. As her death evidently approached, Cecil and the lord admiral desired to know her sentiments with regard to the succession. To this she replied, that as the crown of England had always been held by kings, it must devolve upon 'no rascal: a king should succeed her, and who could that be but her cousin of Scotland?' Being then advised by the archbishop of Canterbury to fix her thoughts on God, she replied that her thoughts did not in the least wander from him. Her voice soon after left her; she fell into a lethargic slumber, which continued some hours; and she expired gently without a groan, on the 24th of March, 1602-3, in the seventieth year of her age, and forty-fifth of her reign.

The kingdoms of Scotland and England, or the whole of Great Britain, now fell under the dominion of one sovereign, by the accession of James VI. of Scotland to the throne of England. He derived his title from being the grandson of Margaret eldest daughter of Henry VII. and, on the failure of all the male line, his right was become incontestable. Although the legislative union of the two countries did not immediately take place; they have, ever since this period, been governed by one sovereign: we therefore shall resume and conclude the history of both under the article GREAT BRITAIN.

England, a small island in the Pacific, near the north coast of New Guinea. Long. 131° 36′ E., lat. 0° 48′ N.

England, Little, beyond Wales, in geography, is a portion of country lying along the south-western coast of South Wales, remarkable for being inhabited by the descendants of a colony of Flemings who came over from Flanders, and settled here in the reign of king Henry I. Camden states, that the occasion of their emigration was an inundation of the sea, which overflowed a great part of the Low Countries. But Dr. Evans and other writers have suggested, with more probability, that it was the policy of that wise monarch to place here a people opposite in their language, manners, and opinions to the Welsh, to assist in his favorite project—the subjugation of the country. Another colony from the same country was incorporated with the first, in the time of Henry II., to which were added numerous Anglo-Normans, and others from the English army. At first these people were confined to the commot of Rhos, which district still more particularly retains the name of Little England beyond Wales. But their numbers increasing in the course of time, they spread along the whole coast, from the lordship of Comes to the mouth of the river Tave. This part of the principality is, to the present day, divided into two districts, denominated Englishery and Welshery. The latter, occupied by the original inhabitants, contains the cantreves of Comes, Cilgerran, part of Arberth, and Dewsland. The former comprises the remainder of Arberth, and the cantreves of Rhos, Castel-Martins, and Doughleddy; and is inhabited by the descendants of the Flemings. Like their ancestors, they are hardy, industrious, and adventurous. The dispositions of the two people are equally striking and adverse. While the Welsh are hot, easily irritated, and obstinately tenacious; these are not easily provoked, and are averse from contention and litigation. Both are distinguishable by their mode of dress, manner of living, the style of their buildings, particularly in their churches, and the names they respectively give to places. All these strongly point out the line of demarcation between them. In the Welshery, not a word of English is heard spoken, while in the next village within the Englishery, not a word of Welsh. The language of the latter district is not much different from the common dialect of England, except in some parts of Rhos and Castle-Martin. The two people avoid all commerce as much as possible, mutually considering each other in a degrading light; and even a pathway will divide them in the same parish. To such an extent was this personal detestation carried among the lower classes, even in modern times, that a matrimonial connexion between the opposite parties was rare, and considered an unfortunate event. The Flemings, however, eventually proved a blessing to Wales, as well as England, by their introduction of the woollen manufactures. And a work, which proves their industry and improving spirit, is yet visible in a road of great extent made by them in this neighbourhood, and still called Fleming's way. *Dr. Evans's South Wales.*

England, New, a country of North America, thus first named by captain Smith in 1614, forms the north-east part of the United States, bounded by Canada on the north, by New Brunswick and the Atlantic on the east, by the Atlantic and Long Island Sound on the south, and by New York on the west. It comprises the states of Vermont, New Hampshire, Massachusetts (including the district of Maine), Rhode Island, and Connecticut. Although each of these states have in, and since the union, become important integral portions of the United States of North America, and will, in their alphabetical places, receive due attention in this work, there are sufficient traces of the distinctive character of New England still remaining in their history as well as in their internal polity, to demand some separate consideration.

The face of the country is uneven, and it may be deemed, on the whole, high and hilly, though its mountains are comparatively small. They run nearly north and south, in ridges parallel to one another. The westernmost range begins in the county of Fairfield, and, passing through the counties of Litchfield and Berks, unites with the Green mountains at Williamstown, in the north-west corner of Massachusetts, being separated only by the narrow valley of Hoosack river. The highest part of this range is Toghkonnuck mountain in Egremont, the south-western corner of the same state. Over this mountain, elevated probably more than 3000 feet above the ocean, runs the boundary between Massachusetts, Connecticut, and New York. The second range is that of the Green mountains. See our article America. The third range has the same commencement with the second at New Haven, in a delightful eminence called the East rock, and passing through the counties of New Haven, Hartford, and Hampshire, extends into Canada. The Blue hills in Southington, mount Tom, which is the principal eminence, mount Holyoke, and mount Toby in Sunderland, are the principal summits of this range south of New Hampshire. This range, which is precipitous and romantic, crosses Connecticut River just below Northampton and Hadley in Massachusetts. There is a fact related by Dr. Dwight respecting these mountains, which seems to throw some light upon the nature of those hitherto unexplained explosions, that are heard in mountainous countries. Such an explosion, about forty years ago, was heard by the inhabitants of Kinsdale township, in New England, from West River Mountain, on the Connecticut. Upon repairing to the place, they discovered that a metallic substance had been forced from the heart of the mountain, the hole which it had made being about six inches in diameter. A few trees which stood near were almost covered with the substance which had been ejected, and which consisted chiefly of melted and calcined iron ore, strongly resembling the scoria of a blacksmith's forge. The same substance was found upon the rocks and the face of the hill in several places, having evidently been propelled in a liquid or semi-liquid-state. It appears clear that this explosion was volcanic.

The south or eastern range begins at Lyme

in Connecticut, and forms the eastern boundary of the Connecticut valley, until it unites with the last-mentioned range in the county of Hampshire; but is less distinctly marked by eminences than the others. The chief single mountains are Saddle Mountain in Massachusetts, computed to be about 4000 feet above the sea, Watchusett in the county of Worcester, Aschutney in the state of Vermont, Monadnock in New Hampshire, and the White Mountains in the same state, of which the highest summit is Mount Washington, probably between 10,000 and 11,000 feet above the ocean, and the highest land in the United States. This mountain is covered during a great part of the year with snow, and is seen in fair weather at the distance of ninety miles from the sea, and 160 from its base.

New England abounds in cataracts and cascades; those of the White Mountains being singularly romantic and beautiful. The principal rivers are the Schoduck, Penobscot, Kennebeck, Amariscoggin, Saco, Piscataqua, Merrimack, Parkers, Charles, Taunton, Providence, Thames, Connecticut, Hooestonnuck or Stratford, Onion, La-Moille, and Missisconi. The largest of these are Penobscot, Kennebeck, Merrimack, and Connecticut. The chief lakes are Champlain and Memphremagog, lying partly in Vermont and partly in New York; Winnipisiogee and Umbagog in New Hampshire; Sebago, Moosehead, Willeguenguagun, and Chilmacook or Grand lake in Maine. The most important and useful harbours are those of Machias, Frenchman's Bay, Wiscasset, Portland and Wells, in Maine; Piscataqua in Hampshire; Newbury Port, Salem, Marble head, Boston, Provincetown, and New Bedford, in Massachusetts Proper; Newport, Bristol, and Providence, in Rhode Island; and New London, New Haven, and Black Rock in Fairfield, in Connecticut. Burlington Bay is the most considerable harbour in lake Champlain, on the Vermont shore.

An extraordinary phenomenon respecting this lake we must be here allowed to insert from Dr. Dwight's Travels in New England, vol. ii. p. 95. 'Friday morning, Oct. 18th, we rode to the south end of the lake accompanied by Mr. Whettlesey to examine a rock of which a singular, not to say an incredible, opinion prevails in the vicinity. Our road, for near half a mile, lay on a natural causeway, about thirty feet in breadth, which separated the lake in two parts, and was formed of earth, probably washed up by its waves. The rock, which was the particular object of our curiosity, is said, by inhabitants long settled here, to have moved a considerable distance from the spot where it anciently stood, towards the south-western shore. You will not suppose we considered this story as founded either in truth or good sense. However, having long believed it to be prudent, and made it a regular practice, whenever it was convenient, to examine the foundation of reports credited by sober men, I determined to investigate this, as I saw that it was firmly believed by several discreet persons. One particularly, a man of unquestioned reputation, and long resident near the spot, declared, that about forty years since, the top of this rock, at the ordinary height of the water, was at least two feet below its surface, and fifteen or twenty rods farther from the causeway than when we saw it. The shore has unquestionably remained as it then was; for the trees and stumps standing on the causeway are older than any man now living, and the space between them and the lake is very narrow, scarcely extending fifteen feet from the trees.

'The top of the rock is now at least two feet above the water. This height it is declared to have gained imperceptibly, year by year, for many years, in consequence of its advancing towards the shore, and standing continually in water more and more shallow. The water is evidently of the same depth now as formerly, as is proved by the appearance of the shore.

'When we came up to the rock, which was standing where the water was scarcely knee-deep, we found a channel behind it, towards the deeper water, formed in the earth, about fifteen rods in length. It was serpentine in its form, and was sunk from two to three feet below the common level of the bottom on its borders. In the front of the rock the earth was pushed up in a heap, so as to rise above the water, declining, however, at the distance of a few inches, obliquely and pretty rapidly. Not far from this rock we saw another, much less, attended by the same phenomena, except that they were diminished in proportion to its size. The whole appearance of each was just as one would expect to find, if both had actually removed from their original places towards the shore, throughout the length of their respective channels. How these channels were formed, or by what cause the earth was heaped up in front of these rocks, I must leave to the divination of others. The facts I have stated, as I believe, exactly.'

The climate of New England is considered very healthy, one in seven, it is said, living to the age of seventy years, and about one in thirteen or fourteen to eighty years and upwards. The most prevalent winds are the north-west, west, and south-west; but the east, and north-east winds, which are insalubrious, occur frequently at certain seasons of the year, particularly in April and May, on the sea-coasts. The coldest winds of all are from the west; and Dr. Dwight has some curious remarks on their origin. 'These winds, says he, are purer than any others; a fact universally remarked throughout this country. During their prevalence the lungs are feasted and the frame invigorated, in such a manner as is never experienced at any other season. Their influence on plants, also, is entirely peculiar. It is customarily said, by those who have long cultivated tobacco, that its leaves, are perceptibly thicker and heavier, after a north-west wind has blown two or three days, than at any other time; and such a season is considered, by skilful cultivators, as the best for cutting this plant. When grass has been mowed at such a season, I have observed the scythes to be covered with its juice, so thick and viscid, and adhering so tenaciously to the scythe, as to oblige the mowers to employ the whetstone, not for the sake of giving the scythe an edge, but to remove the glutinous substance with which it was covered. During the preva-

lence of these winds, wood burns more rapidly, and with a more vivid flame. The flame, also, makes frequently a small explosion (if I may be allowed the term), resembling strongly that of a musket, discharged at a very great distance. All these facts, as it seems to me, are easily explicable on the supposition, that the north-west winds have their origin in the superior regions of the atmosphere. If this opinion be admitted, we cannot, I think, be at a loss for reasons why they are instantaneously, and, in the winter, severely cold; why they commence with violence and terminate suddenly; why they are remarkably pure and healthy; why in a singular manner they facilitate combustion; why they are wholly free from terrene exhalations; why, in many instances, they condense clouds immediately vertical, some time before they are perceived to blow on the surface; why they carry clouds, at times, toward the south-east, without interrupting at all the blowing of a south-west wind; and why in the month of March, during which the westerly winds almost regularly prevail, all kinds of wood shrink, and become dry, in a greater degree than in the most intense heat of our summer sun. Particularly, the peculiar degree of cold, experienced in this country, seems to be explicable on this ground only. Every man, accustomed to read even newspapers, knows that the air, at a moderate distance from the earth, is usually much colder than near the surface. This fact has been so often proved by ascending high mountains, and by rising into the atmosphere in balloons; and is so evident from the ice and snow, always visible, even under the equator, at great elevations, that few persons are ignorant of it. Every degree of cold experienced in this country, must naturally be expected from winds, which have their origin in a superior region.' Travels, vol. i. pp. 44, 45.

The weather is less variable in New England than in the middle, and especially the southern states of the Union, and more so than in Canada. The extremes of heat and cold are, according to Fahrenheit's thermometer, from 20° below to 100° above 0; the medium being from 48° to 50°. The quantity of water which annually falls here is from forty-two to forty-eight, and yet they suffer here more from drought than in England, where the annual quantity of water is estimated at about twenty-four inches. Hence it is inferred that the atmosphere is remarkably dry, and thus some have accounted for its singular salubrity. Winter commonly commences, in its severity, about the middle of December; sometimes earlier, and sometimes not till Christmas. The diseases most prevalent are alvine fluxes, St. Anthony's fire, asthma, atrophy, catarrh, colic, inflammatory, slow, nervous, and mixed fevers, pulmonary consumption, quinsy, and rheumatism. Dr. Dwight observes that a succession of cold years have proved peculiarly unfavorable to health in New England; the spotted fever, which was a new disease, and the spurious peripneumony, which had never before been known to be endemic there, having ravaged great part of the country, at a late period of this kind. The latter indeed became a formidable scourge to the people; heads of families, the men especially, having been swept away in such unprecedented numbers, that more children had been made orphans than at any preceding time since the country was colonised; and there was every reason to fear that it would pervade the Union; for, beginning in Connecticut in 1812, it had, in the course of three years, spread extensively over Virginia and Ohio.

The soil exhibits every diversity from barren sands to the richest loams and clays. The hills are covered with brown loam intermixed with gravel, and are very favorable to grazing; in the western parts of the country, wheat, and all other kinds of grain and fruits appear suited to the climate. The clayey soils, when well manured, are also very productive. A rich loam, varying towards clay, is prevalent in Connecticut, and is favorable to every kind of cultivation. Sand is generally found on the plains; and the yellow pine plains, which are a mixture of sand and gravel, are friendly to every production that does not require a richer soil. The white pine plains are usually covered with loam, and these, as well as some of the last-mentioned in the same condition, are uncommonly fertile. The valleys are a rich mould; and the intervals, bordering the various streams, are generally sands formed by earth deposited by the floods in the spring, and are of the richest quality. Generally speaking, New England seems better adapted for grazing than for grain, though a sufficient quantity of the latter is raised for home consumption, if we except wheat which is largely imported, particularly into Massachusetts, from the middle and southern states. Indian corn, rye, oats, barley, buck-wheat, flax, and hemp, generally succeed very well. Fruits of every kind, which suit a temperate climate, may be obtained in abundance. The summer heat brings to perfection peaches, apricots, and nectarines. Orchards of apple-trees cover a considerable part of the whole country, and cyder is the common drink of the inhabitants. Pears, plums, cherries, currants, gooseberries, whortleberries, blackberries, bilberries, &c., abound. Perry is made in some parts of the country, but not in great quantities. Various species of the hickory and hazle-nuts, and chestnuts, are plentifully furnished by the southern half of New England. In travelling through the forests of New England (which, even in the old states of America, still occupy no small portion of the soil, notwithstanding the improvident destruction of wood) Dr. Dwight was forcibly struck with the wisdom of divine providence displayed in the decay of the foliage. Were the leaves, when they fall, to go through the usual processes of fermentation and putrefaction, like other vegetables, the atmosphere would be rendered so unwholesome that it would be impossible for man either to inhabit or to clear a forested country. But the juices are exhaled before the leaves fall; they lie lightly on the ground, so as to permit a free circulation of air: so far from being offensive in their decay, they have even a peculiar fragrance, which poets have sometimes noticed among the melancholy charms of autumn; the mould into which they are converted 'appears to be the best of all manures, being suited to more kinds, and producing higher degrees of vegetation than any other.'

The pioneers of civilisation bivouaque, or, in the true phrase, squat, in full assurance of their salubrity, in the woods; and endemial discases are unknown there till men, collected in societies, prepare the way for and induce them, by their improvidence, their errors, their injurious habits, or their crimes. For example, no country abounds more with small lakes and ponds than New England: they are supplied by subjacent springs; the water is cool, sweet and pure; and the margins are universally healthy ground. Dr. Dwight could not, after 'very extensive enquiries,' discover a single exception to this fact; but where dams have been raised, and artificial mill-ponds constructed, remittent and autumnal fevers have become endemic to an alarming degree. The mongrel cedar appears to shed its leaves here in a manner which has not yet been observed in any other tree. It resembles in its growth a spreading oak of moderate size—which in Europe would be an enormous tree. In autumn red spots, not unlike roses at a little distance, but generally larger, are dispersed over it: upon examination it is found that these are small twigs, the growth of the existing, or perhaps the preceding, year, which die together with their leaves, assume a red or reddish brown color in their decay, and fall; so that the tree sheds its leaves not singly but with the spray from which they spring, exchanging annually, according to Dr. Dwight's observations, about a third of its foliage, in this manner. Singular as the fact is, it seems heretofore to have passed unnoticed, and the author could find no person able to give him any account of it: but he had opportunities of examining and verifying it himself in his different journeys.

Gardening is much improved, and its productions are daily varying and increasing. But the most important production of New England is grass. The high and rocky ground is in many parts covered with clover, and affords excellent pasture to some of the finest cattle in the world. The quantity of butter and cheese made for exportation is very great. Considerable attention is now paid to the raising of sheep; and the wool is in a state of progressive improvement. The principal exports of New England are mackarel, salmon, cod, and other fish; whale-oil and whale-bone, timber, masts, boards, staves, hoops and shingles; horses, mules, salted beef, and pork, potash, pearlash, flax-seed, apples, cyder, corn, butter, and cheese.

New England is considered one of the most populous parts of the United States; its states, in 1790, contained 1,009,522 persons; in 1800, 1,233,011. The following is

TABLE I.—The Free White population of the New England States, the Free Persons of Colou and the Slaves, in 1830.

| States. | Free White Persons. | Free Colored Persons. | Slaves. | Total. |
|---|---|---|---|---|
| Maine | 398,263 | 1,190 | 2 | 399,455 |
| New Hampshire | 268,721 | 604 | 3 | 269,328 |
| Vermont | 279,771 | 881 | | 280,652 |
| Massachusetts | 603,359 | 7,048 | 1 | 610,408 |
| Rhode Island | 93,621 | 3,561 | 17 | 97,199 |
| Connecticut | 289,603 | 8,047 | 25 | 297,675 |
| Total | 1,933,338 | 21,331 | 48 | 1,954,717 |

TABLE II.—The classification of the productive Inhabitants of each State; the number of Persons engaged in Agriculture, Commerce, and Manufactures, in each of the United States; together with the proportion which each class forms of the whole Population.

| States. | Persons engaged in | | | | | |
|---|---|---|---|---|---|---|
| | Agriculture. | | Commerce. | | Manufactures. | |
| | Number. | Proportion. | Number. | Proportion. | Number. | Proportion. |
| Maine | 55,031 | 18·5 | 4,297 | 1·5 | 7,643 | 2·5 |
| New Hampshire | 52,384 | 21·4 | 1,068 | ·4 | 8,699 | 3·5 |
| Massachusetts | 63,460 | 12·1 | 13,301 | 2·5 | 33,464 | 6·4 |
| Rhode Island | 12,559 | 15·1 | 1,162 | 1·4 | 6,091 | 7·5 |
| Connecticut | 50,518 | 18·1 | 3,581 | 1·3 | 17,541 | 6·4 |
| Vermont | 50,951 | 21·6 | 776 | ·3 | 8,484 | 3·6 |
| Total | 289,903 | | 24,185 | | 81,922 | |

TABLE III.—The States in the order of their Population in 1830, with the Population in 1800, 1810, and 1820.

| States. | 1800. | 1810. | 1820. | 1830. | Rate of Increase. |
|---|---|---|---|---|---|
| Massachusetts . . . . | 422,845 | 472,040 | 523,287 | 610,408 | 16.64 |
| Maine . . . . . . . | 151,719 | 228,705 | 298,335 | 399,955 | 33.88 |
| Connecticut . . . . | 251,002 | 261,942 | 275,248 | 297,675 | 8.14 |
| New Hampshire . . . | 183,858 | 214,460 | 244,161 | 269,328 | 10.30 |
| Vermont . . . . . | 154,465 | 217,895 | 235,764 | 80,652 | 10.04 |
| Rhode Island . . . . | 69,152 | 76,931 | 83,059 | 97,199 | 17.01 |
| New England States and Territories . . . . | 1,233,041 | 1,471,973 | 1,659,854 | 1,955,217 | |

The great body of the inhabitants consists of land-holders and cultivators of the soil. As they possess in fee-simple the farms which they cultivate, they are all naturally attached to their country; and the cultivation of the soil makes them robust and healthy. New England has been not unaptly denominated a nursery of men; and hence are annually transplanted, into other parts of the United States, thousands of its natives. They are almost universally of English descent; and to this circumstance, as well as to the general attention that has been paid to education, it is owing that the English language has been preserved among them in so considerable a degree of purity. A succession of New England villages, says the intelligent traveller from whom we have quoted other observations in this article, composed of neat houses, surrounding neat school-houses and churches, adorned with gardens, meadows, and orchards, and exhibiting the universally easy circumstances of the inhabitants, is, at least in my own opinion, one of the most delightful prospects which this world can afford. 'You are to understand, that every man in this country, almost without an exception, lives on his own ground. The lands are universally holden in fee simple; and descend by law to all the children in equal shares. Every farmer in Connecticut, and throughout New England, is therefore dependent for his enjoyments on none but himself, his government, and his God; and is the little monarch of a dominion, sufficiently large to furnish all the supplies of competence, with a number of subjects as great as he is able to govern. In the cultivation of his farm he gratifies his reason, his taste, and his hopes; and usually finds the gratification at least sufficient for such a world as this. Here he can do every thing which is right, and no man can with impunity do any thing to him that is wrong. If he is not in debt, an event necessary only from sickness or decrepitude, he is absolutely his own master, and the master of all his possessions.'

The New Englanders are tall, stout, and well made. Their education, laws, and situation, serve to inspire them with high notions of liberty, of which they are jealous in some cases, perhaps, to excess. A chief foundation of freedom in the New England states is a law, by which intestate estates descend to all the children, or other heirs, in equal proportion; and hence it happens that the people of New England enjoy an equality of condition, that is unknown to any other part of the world. They are described as being generally frugal, industrious, and inured to habits of sobriety and temperance. Learning is as much diffused among all ranks of people in New England perhaps as in any other part of the globe; which is owing to the establishment of schools in every town. In these schools, generally supported by a public tax, are taught the elements of reading, writing and arithmetic; and in some of the principal and more wealthy towns they introduce the superior branches of grammar, geography, and other sciences. Literature is also encouraged and diffused by the circulation of newspapers and periodical publications, and by the establishment of reading societies and parochial libraries. Curiosity, and a desire of information, are very prevalent in New England; and the common people, it is said, are distinguished by attention to strangers. In former times the New Englanders were strict, to a degree of punctiliousness, in their observance of the sabbath; and hence, as well as from some other traits of their character, they acquired the character of a superstitious and bigoted people. But a catholic, tolerant spirit, occasioned by a more enlarged intercourse with mankind, has of late much increased, and is becoming universal. 'If,' says Dr. Morse, 'they do not go beyond the proper bounds, and liberalise away all true religion, of which there is very great danger, they will counteract that strong propensity in human nature which leads men to vibrate from one extreme to its opposite.'

The custom still prevails, transmitted to the present race from their ancestors, of annually celebrating fasts and thanksgivings. In spring, the governors of the several New England states, Rhode Island excepted, proclaim a day of fasting, humiliation, and prayer; and in autumn, after harvest, they appoint a day of public thanksgiving. Many of the women are handsome. Those who have enjoyed the advantages of a good education are numerous, genteel, and agreeable in their manners, and sprightly and sensible in their conversation. It is the laudable practice here among all ranks of females to accustom themselves at an early period to the management of domestic concerns. Employment at the needle, in cookery, and at the spinning-wheel, is honorable. The women in country

towns manufacture the greater part of the clothing of their families. Their linen and woollen cloths are excellent. Among the amusements of the people of New England is dancing, of which the young people of both sexes are extremely fond. The athletic and healthy diversions of cricket, foot-ball, quoits, wrestling, jumping, hopping, foot-races, and prison-bars, are universally practised in the country, and some of them in the most populous places, and by people of almost all ranks. Of the religion of the New Englanders, and of the provision that is made for the support of it, we have already spoken under the article AMERICA. We may here however observe, that the constitution of these states especially provides against the making of any law respecting an establishment of religion, or prohibiting the free exercise of it. And, in the constitution of all the different states, religious liberty is a fundamental principle.

'All countries,' as Dr. Dwight says, 'contain restless inhabitants; men impatient of labor; men, who will contract debts without intending to pay them: who had rather talk than work; whose vanity persuades them that they are wise, and prevents them from knowing that they are fools; who are delighted with innovation; who think places of power and profit due to their peculiar merits; who feel that every change from good order and established society will be beneficial to themselves; who have nothing to lose, and therefore expect to be gainers by every scramble; and who, of course, spend life in disturbing others, with the hope of gaining something for themselves. Under despotic governments they are awed into quiet; but in every free community they create, to a greater or less extent, continual turmoil; and have often overturned the peace, liberty, and happiness of their fellow-citizens. In the Roman commonwealth, as before in the republics of Greece, they were emptied out, as soldiers, upon the surrounding countries; and left the sober inhabitants in comparative quiet at home. It is true they often threw these states into confusion, and sometimes overturned the government. But if they had not been thus thrown off from the body politic, its life would have been of a momentary duration. As things actually were, they finally ruined all these states: for some of them had, as some of them always will have, sufficient talents to do mischief; at times very extensive. The Gracchi, Clodius, Marius, and Marc Antony, were men of this character. Of this character is every demagogue, whatever may be his circumstances. Power and profit are the only ultimate objects which every such man, with a direction as steady as that of the needle to the pole, pursues with a greediness unlimited and inextinguishable.

'Formerly the energetic government established in New England, together with the prevailing high sense of religion and morals, and the continually pressing danger from the French and the savages, compelled the inhabitants into habits of regularity and good order, not surpassed, perhaps, in the world But since the American revolution our situation has become less favorable to the existence, as well as to the efficacy, of these great means of internal peace. The former exact and decisive energy of the government has been obviously weakened. From our ancient dangers we have been delivered, and the deliverance was a distinguished blessing; but the sense of danger regularly brings with it a strong conviction that safety cannot be preserved without exact order, and a ready submission to lawful authority. The institutions and the habits f New England, more I suspect than those of any other country, have prevented or kept down this noxious disposition; but they cannot entirely prevent either its existence or its effects. In mercy, therefore, to the sober, industrious, and well-disposed inhabitants, Providence has opened in the vast western wilderness a retreat, sufficiently alluring to draw them away from the land of their nativity. We have many troubles even now: but we should have many more if this body of foresters had remained at home.'—vol. ii. pp. 441—443.

Dr. Dwight assures us, that 'fewer capital crimes have been committed in New England since its establishment, than in any other country on the globe (Scotland perhaps excepted), in proportion to the number of inhabitants.' Yet of the laborer in New England, he says, 'Almost every man of this character is either shiftless, diseased, or vicious. And yet employment is found every where, and subsistence is abundant and easily obtained. The price of labor is also very high, a moderate day's work being usually purchased at a dollar. Every healthy, industrious, prudent man, may therefore live almost as he wishes, and secure a competence for old age.' Nevertheless he affirms, that few of these men are very industrious, fewer economical, and fewer still virtuous. The mechanics he describes as being, in all respects, of a different character. Perhaps it will be found, that up to a certain degree in society, morals, as well as manners, improve at every step of the ascent; for character becomes of more importance, when there is more to lose and more to hope; and men sometimes become respectable in proportion as they feel their own respectability. Another class who are important missionaries of civilisation in South America, and whose services cannot easily as yet be dispensed with in many parts of the United States, are portrayed in dark colors Speaking of the persons who are employed in peddling articles of small value about the country, Dr. Dwight says, 'the consequences of this employment, and of all others like it, are generally malignant, and that it has had an unhappy influence on both the morals and manners of the people.' 'Men,' he says, 'who begin life with bargaining for small wares, will almost invariably become sharpers. The commanding aim of every such man will soon be to make a good bargain, and he will speedily consider every gainful bargain as a good one. The tricks of fraud will assume in his mind the same place which commercial skill and an honorable system of dealing hold in the mind of a merchant. Often employed in disputes, he becomes noisy, pertinacious, and impudent.

The spirit of subdividing, he afterwards adds, 'has produced, and is still producing, un-

happy consequences in the state of society in New England. Offices are multiplied to a useless degree, and beyond the ability of the country to fill them with advantage. Yet the fact, that so many of these subdivisions have been made, becomes a powerful reason for making more. He, who voted for the last, claims the suffrage of him who has been profited by that vote, in his own favor. In this manner a silly and deplorable ambition becomes a source of multiplied mischiefs to the community. Small parishes are unable, without serious inconvenience, to keep their churches in repair, and support their ministers. Small towns are often obliged to send diminutive representatives, because they can send no other. Small counties have often very imperfect courts, because they have no materials out of which to constitute better. Representatives also are in this manner multiplied beyond every rational limit. In most of the New England states the number is twice, and in Massachusetts at least three times as great as either experience or common sense would justify.'—vol. i. p. 146.

'The county of Hampshire, after having existed as a fine Doric column of industry, good order, morals, learning, and religion, in Massachusetts for more than a century, was by an unwise legislature broken into three parts. Of its ruins were formed the three counties, of Franklin on the north, Hampshire in the middle, and Hampden on the south; each of them extending through the original breadth of the county of Hampshire. One political purpose, intended to be accomplished by this disruption, was to destroy the firm order and sound principles of the inhabitants. How far this plan will succeed time alone can discover. From analogy it may be concluded, or at least rationally feared, that the inhabitants will lose some part of their elevation of character. Little counties almost of course have little officers, and little concerns; and the existence of these is but too commonly followed by a contraction of views, a diminution of measures, a destruction of influence, and a deterioration of character.'—vol. ii. p. 258.

New England was first settled by persons driven by religious persecution from their native country, and the inhabitants still exhibit traces of their descent from the Puritans. The first attempt to form a regular settlement here was at Sagahadock in 1607; but, in the following year, the whole number of those who survived returned to England. The first company that laid the foundation of the New England states, planted themselves at Plymouth, in November 1620; though this appellation was given to North Virginia by captain Smith in August 1614. The founders of the colony consisted of 101 persons. In 1640 the importation of settlers ceased, in consequence of the abatement of persecution in England. At this time the number of emigrants who had traversed the seas in 298 vessels, from the commencement of the colony, amounted to 21,200 men, women and children, forming, perhaps, about 4000 families. In 1760 the number of inhabitants in Massachusetts Bay, New Hampshire, Connecticut, and Rhode Island, amounted probably, to 500,000. *Morse's Gazetteer.*

ENGLECHERIE, ENGLESCHERY, or ENGLESCHYRE, in old English law, the quality of being an Englishman. If a man were privately slain or murdered, he was anciently accounted francigena (which comprehended every alien, especially the Danes) till *englecherie* was proved, i.e. till it was made to appear that he was an Englishman. Bracton, lib. iii. This custom is traced to the reign of Canute, who having conquered England, at the request of his nobles, sent back his army into Denmark, only reserving a guard for his person (see ENGLAND); and made a law, that if any person was murdered, he should be supposed to be a Dane, if he was not proved to be an Englishman. In default of such proof, if the murderer was unknown, or had made his escape, the township where the man was slain should be charged to pay sixty-six marks into the exchequer: or, if that sum could not be raised thence, it was to be paid by the hundred. After this law, which was continued by William the Conqueror, for the like security to his own Normans, whenever a murder was committed, it was necessary to prove the party slain an Englishman, that the penalty of sixty-six marks might not be charged on the village. The manner of proving the person killed to be an Englishman was by two witnesses, who knew the father and mother, before the coroner, &c. Englecherie was finally abolished by statute 14 Edw. III. cap. 4.

ENGLEFIELD (sir Henry Charles), F.R.S. the last baronet of a family settled at the village and manor of this name, near Reading, ever since 1272. Sir Henry Englefield was born in 1752, and succeeded to the baronetage in 1780. In 1788 he was elected a fellow of the Royal Society, and the year following of that of the Antiquaries. His numerous and elegant contributions to the Archaeologia are a lasting monument of his erudition and taste. Besides these and various papers in the Philosophical Transactions, and the Transactions of the Linnæan Society (of which he was also a member), he published Tables of the apparent places of the Comet of 1661; and a tract On the Determination of the Orbits of Comets according to Boscovich and De la Place, 4to. 1793; A walk through Southampton, with plates of its antiquities, 8vo. 1801; A Description of the principal Picturesque Beauties and Geological Phenomena of the Isle of Wight, 4to, and folio 1816; and a metrical translation of the Andria of Terence. On the decease of marquis Townsend he was for a short time president of the Antiquarian Society. He died March 21st, 1822, at his house in May Fair.

ENGLEFIELD BAY, a deep bay on the western shore of Queen Charlotte's Island. It was so called by Vancouver, after the above sir Henry Englefield.

EN'GLISH, *n. s.*, *adj.* & *v. a.* Sax. englen; Teut. *englisch*; Goth. *englisk*; Fr. *anglois*. See the article ENGLAND. The people of England; the language of England; of or relating to England: as a verb, to translate into that language.

He hath neither Latin, French, nor Italian; and you may come into the court, and swear that I have a poor pennyworth in the *English*. *Shakspeare.*

The hollow instrument terebra, we may *english* piercer. *Bacon.*

Their *English* tongue reacheth along the east coast unto the farthest parts of Scotland; and the people thereof are called—*the English*. *Camden's Remains.*

We find not a word in the text can properly be rendered anise, which is what the Latins call anethum, and properly *englished* dill. *Browne.*

Of *English* talc, the coarser sort is called plaister, or parget; the finer, spoad. *Woodward.*

English Bible. In the article Bible, we have given an account of the formation of the sacred canon of the Old and New Testaments. The English versions of the Scriptures, however, were felt to be sufficiently important to demand separate consideration.

The earliest portion of Scripture that ever appeared in the language of this country was a translation of the psalms into Saxon by Adhelm or Adelme, the first bishop of Sherborne, about the year 706. A Saxon version of the four gospels was made by Egbert, bishop of Lindisfern, who died A. D. 721; and, a few years after, the venerable Bede translated the entire Bible into that language. Nearly 200 years after Bede, king Alfred executed another translation of the psalms, either to supply the loss of Adhelm's (which is supposed to have perished in the Danish wars), or to improve the plainness of Bede's version. A Saxon translation of the Pentateuch, Joshua, part of the books of Kings, Esther, and the apocryphal books of Judith, and the Maccabees, is also attributed to Elfric or Elfred, who was archbishop of Canterbury, A. D. 995.

Several centuries now elapsed, during which the Scriptures appear to have been buried in oblivion, the general reading of them being prohibited by the papal see. The first English translation of the Bible known to be extant was executed by an unknown individual, and is placed by archbishop Usher to the year 1290: of this there are three manuscript copies preserved in the Bodleian library, and in the libraries of Christ Church and Queen's Colleges, at Oxford. Towards the close of the following century, John de Trevisa, vicar of Berkeley in the county of Gloucester, at the desire of his patron, lord Berkeley, is said to have translated the Old and New Testaments into the English tongue. But, as no part of this work appears ever to have been printed, the translation ascribed to him is supposed to have been confined to a few texts, which were painted on the walls of his patron's chapel at Berkeley castle, or which are scattered in some parts of his works, several copies of which are known to exist in manuscript.

Nearly contemporary with Berkeley was the celebrated John Wickliffe, who, about the year 1380, translated the entire Bible from the Latin Vulgate into the English language as then spoken, not being sufficiently acquainted with the Hebrew and Greek languages to translate from the originals. Before the invention of printing, transcripts were obtained with difficulty, and copies were so rare, that, according to the registry of William Alnewick, bishop of Norwich, in 1429, the price of one of Wickliffe's Testaments was not less than four marks and forty pence, or £2 16*s*. 8*d*., a sum equivalent to more than £40 at present. This translation of the Bible, we are informed, was so offensive to those who were for taking away the key of knowledge and means of better information, that a bill was brought into the house of lords, 13 Rich. II., A. D. 1390, for the purpose of suppressing it. On which the duke of Lancaster, the king's uncle, is reported to have spoken to this effect: 'We will not be the dregs of all, seeing other nations have the law of God, which is the law of our faith, written in their own language.' At the same time he declared in a very solemn manner, 'That he would maintain our having this law in our own tongue against those, whoever they should be, who first brought in the bill.' The duke was seconded by others, who said, 'That if the Gospel, by its being translated into English, was the occasion of running into error, they might know that there were more heretics to be found among the Latins than among the people of any other language. For that the decretals reckoned no fewer than sixty-six Latin heretics; and so the Gospel must not be read in Latin, which yet the opposers of its English translation allowed.' Through the duke of Lancaster's influence the bill was rejected; and this success gave encouragement to some of Wickliffe's followers to publish another and more correct translation of the Bible. But in the year 1408, in a convocation held at Oxford by archbishop Arundel, it was decreed by a constitution, 'That no one should thereafter translate any text of Holy Scripture into English, by way of a book, or little book, or tract; and that no book of this kind should be read, that was composed lately in the time of John Wickliffe, or since his death.' This led the way to great persecution, and many persons were punished severely, and some even with death, for reading the Scriptures in English.

For the first printed English translation of the Scriptures we are indebted to William Tindal, who, having formed a design of translating the New Testament from the original Greek into English, removed to Antwerp in Flanders for this purpose. Here, with the assistance of the learned John Fry, or Fryth, who was burned on a charge of heresy in Smithfield in 1552, and a friar, called Wm. Roye, who suffered death on the same account in Portugal, he finished it, and in the year 1526 it was printed either at Antwerp or Hamburgh, without a name, in a middle sized 8vo. volume, and without either calendar, references in the margin, or table at the end. Tindal annexed a pistil at the close of it, in which he 'desyred them that were learned to amende if ought were found amysse.' Le Long calls this 'the New-Testament translated into English, from the German version of Luther;' but for this degrading appellation he seems to have no other authority besides a story related by one Cochlæus, an enemy of the reformation, with a view of depreciating Tindal's translation. Many copies of this translation found their way into England; and to prevent their dispersion among the people, and the more effectually to enforce the prohibition published in all the dioceses against reading them, Tonstall, bishop of London, purchased all the remaining copies of this edition,

and all which he could collect from private hands, and committed them to the flames at St. Paul's cross. The first impression of Tindal's translation being thus disposed of, several other numerous editions were published in Holland, before the year 1530, in which Tindal seems to have had no interest, but which found a ready sale, and those which were imported into England were ordered to be burned. On one of these occasions, Sir Thomas More, who was then chancellor, and who concurred with the bishop in the execution of this measure, enquired of a person who stood accused of heresy, and to whom he promised indemnity, on consideration of an explicit and satisfactory answer, how Tindal subsisted abroad, and who were the persons in London that abetted and supported him; to which enquiry the heretical convert replied, 'It was the bishop of London who maintained him, by sending a sum of money to buy up the impression of his testament.'

In 1530 a royal proclamation was issued, by the advice of the prelates and clerks, and of the universities, for totally suppressing the translation of the Scripture, *corrupted* by William Tindal. The proclamation set forth, that it was not necessary to have the Scriptures in the English tongue, and in the hands of the common people; that the distribution of them, as to allowing or denying it, depended on the discretion of their superiors; and that, considering the malignity of the time, an English translation of the Bible would rather occasion the continuance, or increase of errors, than any benefit to their souls. However, the proclamation announced the king's intention, if the present translation were abandoned, at a proper season, to provide that the Holy Scriptures should be by great, learned, and catholic persons, translated into the English tongue, if it should then seem convenient. In the mean time, Tindal was busily employed in translating from the Hebrew into the English the five books of Moses, in which he was assisted by Miles Coverdale. But his papers being lost by shipwreck in his voyage to Hamburgh, where he designed to print it, a delay occurred, and it was not put to press till the year 1530. It is a small 8vo., printed at different presses, and with different types. In the preface he complained, that there was not so much as one *i* in his New Testament, if it lacked a tittle over its head, but it had been noted, and numbered to the ignorant people for an heresy, who were made to believe, that there were many thousand heresies in it, and that it was so faulty as to be incapable of amendment or correction. In this year he published an answer to Sir Thomas More's Dialogue, containing his reasons for the changes he had introduced into his translation. The three former editions of Tindal's English New Testament being all sold off, the Dutch booksellers printed a fourth in this year, in a smaller volume and letter. In 1531 Tindal published an English version of the prophet Jonah, with a prologue, full of invective against the church of Rome. Strype supposes that before his death he finished all the Bible but the Apocrypha, which was translated by Rogers; but it seems more probable that he translated only the historical parts.

In 1534 was published a fourth Dutch edition, or the fifth in all, of Tindal's New Testament, in 12mo. In this same year Tindal printed his own edition of the New Testament in English, which he had diligently revised and corrected; to which is prefixed a prologue; and at the end are the pistils of the Old Testament, closing with the following advertisement:—'Imprinted at Antwerp, by Marten Emperour, anno M. D. xxxiv.' Another edition was published this year, in 16mo. and printed in a German letter. Hall says, in his Chronicle, printed during the reign of Henry VIII. by Richard Grafton, the benefactor and friend of Tindal; 'William Tindal translated the New Testament, and first put it into print; and he likewise translated the five books of Moses, Joshua, Judicum, Ruth, the books of Kings, and books of Paralipomenon, Nehemiah, and the first of Esdras, and the prophet Jonas; and no more of the Holy Scriptures.' Upon his return to Antwerp, in 1531, king Henry VIII. and his council, contrived means to have him seized and imprisoned. After long confinement he was condemned to death by the emperor's decree in an assembly at Augsburgh; and in 1536 he was strangled at Villefort, near Brussels, the place of his imprisonment, after which his body was reduced to ashes. He expired, praying repeatedly and earnestly, 'Lord, open the king of England's eyes.' Several editions of his Testament were printed in the year of his death. Tindal had little or no skill in the Hebrew, and therefore he probably translated the Old Testament from the Latin. The knowledge of languages was in its infancy; nor was our English tongue arrived at that degree of improvement which it has since attained; it is not, therefore, surprising, that there should be many faults in this translation which need amendment. This, indeed, was a task, not for a single person, but requiring the concurrence of many, in circumstances much more favorable for the execution of it than those of an exile. Nevertheless, although this translation is far from being perfect, few first translations, says Dr. Geddes, will be found preferable to it.

In 1535 the whole Bible, translated into English, was printed in folio, and dedicated to the king by Miles Coverdale, a man greatly esteemed for piety, knowledge of the Scriptures, and diligent preaching; on account of which qualities king Edward VI. advanced him to the see of Exeter. In his dedication and preface, he observes to this purpose, that, as to the present translation, it was neither his labor nor his desire to have this work put into his hand; but 'when others were moved by the Holy Ghost to undertake the cost of it,' he was the more bold to engage in the execution of it. Agreeably, therefore, to desire, he set forth this 'special' translation, not in contempt of other men's translation, or by way of reproving them, but humbly and faithfully following his interpreters, and that under correction. Of these, he said, he used five different ones, who had translated the Scriptures not only into Latin, but also into Dutch. He further declared, that he had neither wrested nor altered so much as one word for the maintenance of any manner of sect, but had with a clear con

science purely and faithfully translated out of the foregoing interpreters, having only before his eyes the manifest truth of the Scriptures. But because such different translations, he saw, were apt to offend weak minds, he added, that there came more understanding and knowledge of the Scripture by these sundry translations, than by all the glosses of sophistical doctors; and he therefore desires, that offence might not be taken, because one translated 'scribe,' and another 'lawyer,' one 'repentance,' and another 'penance,' or 'amendment.' This is the first English Bible allowed by royal authority; and also the first translation of the whole Bible printed in our language. It was called a 'special' translation, because it was different from the former English translations; as Lewis has shown by comparing it with Tindal's. It is divided into six tomes or parts, adorned with wooden cuts, and furnished with Scripture references in the margin. The last page has these words:—'Prynted in the yeare of our Lorde, M. D. xxxv. and fynished the fourth day of October.' Of this Bible, there was another edition in a large 4to., 1550, which was republished, with a new title, 1553; and these, according to Lewis, were all the editions of it. Coverdale, in this edition of the English Bible, prefixed to every book the contents of the several chapters, and not to the particular chapters, which was afterwards the case: and he likewise omitted all Tindal's prologues and notes. Soon after this Bible was finished, in 1536, lord Cromwell, keeper of the privy seal, and the king's vicar-general and vicegerent in ecclesiastical matters, published injunctions to the clergy by the king's authority, the seventh of which was, that every parson, or proprietary of any parish church within this realm, should, before the 1st of August, provide a book of the whole Bible, both in Latin and in English, and lay it in the choir, for every man that would, to look and read therein; and should discourage no man from reading any part of the Bible either in Latin or English, but rather comfort, exhort, and admonish every man to read it, as the very word of God, and the spiritual food of a man's soul, &c. In 1537 another edition of the English Bible was printed by Grafton and Whitchurch, at Hamburgh, as some think; or, as others suppose, at Malborow, or Marpurg in Hesse, or Marbeck, in the duchy of Wittenberg, where Rogers was superintendant. It bore the name of Thomas Matthewe, and it was set forth with the king's most gracious licence.

In the following year an injunction was published by the vicar-general of the kingdom, ordaining the clergy to provide, before a certain festival, one book of the whole Bible, of the largest volume in English, and to set it up in some convenient place within their churches, where their parishioners might most commodiously resort to read it. A royal declaration was also published, which the curates were to read in their several churches, informing the people, that it had pleased the king's majesty to permit and command the Bible, being translated into their mother tongue, to be sincerely taught by them, and to be openly laid forth in every parish church.

In the course of the year 1538 a quarto edition of the New Testament, in the Vulgate Latin, and Coverdale's English, bearing the name of Hollybushe, was printed, with the king's licence, by James Nicholson. Of this another more correct edition was published in 1539, in 8vo., and dedicated to lord Cromwell. In 1538 an edition in 4to. of the New Testament, in English, with Erasmus's Latin translation, was printed with the king's licence, by Redman. In this year it was resolved to revise Matthewe's Bible, and to print a correct edition of it. With this view Grafton went to France, where the workmen were more skilful, and the paper was both better and cheaper than in England, and obtained permission from Francis I. at the request of king Henry VIII. to print this Bible at Paris. But, notwithstanding the royal licence, the inquisition interposed, and issued an order, dated December 17th, 1538, summoning the French printers, their English employers, and Coverdale, the corrector of the work, and prohibiting them to proceed; and the impression, consisting of 2500 copies, was seized, confiscated, and condemned to the flames. Some chests, however, of these books, escaped the fire, by the avarice of the person who was appointed to superintend the burning of them; and the English proprietors, who had fled on the first alarm, returned to Paris as soon as it subsided, and not only recovered some of these copies, but brought with them to London the presses, types, and printers, and, resuming the work, finished it in the year 1539.

In 1539 another Bible was printed by John Byddell, called 'Taverner's Bible,' from the name of its conductor, Richard Taverner; who was educated at Christ Church, Oxford, patronised by lord Cromwell, and probably encouraged by him to undertake the work, on account of his skill in the Greek tongue. This is neither a bare revisal of the English Bible just described, nor a new version; but a kind of intermediate work, being a correction of what is called 'Matthewe's Bible,' many of whose marginal notes are adopted, and many omitted, and others inserted by the editors. It is dedicated to the king.

In the year 1540 two privileged editions of the Bible, which had been printed in the preceding year, issued from the press of Edward Whitchurch. Lewis mentions three other impressions of the 'Great Bible,' which appeared in the course of this year; two printed by Whitchurch, and one by Petyt and Redman. Cranmer wrote a preface for the editions of the year 1540, from which we learn the opinions and practice of those times. In May of this year the curates and parishioners of every parish were required, by royal proclamation, to provide themselves with the Bible of the largest volume before the feast of All Saints, under the penalty of forty shillings for every month during which they should be without it. The king charged all ordinaries to enforce the observance of this proclamation; and he apprised the people, that his allowing them the Scriptures in their mother-tongue was not his duty, but an evidence of his goodness and liberality to them, of which he exhorted them not to make an ill use. In May 1541 one edition of Cranmer's Bible was finished by Richard Grafton; who, in the November following, com-

pleted also another Bible of the largest volume, which was superintended, at the king's command, by Tonstal, bishop of Durham, and Heath, bishop of Rochester.

After the death of Cromwell the English translation was represented to the king as very erroneous and heretical, and destructive of the harmony and peace of the kingdom. In the convocation, assembled in February 1542, the archbishop, in the king's name, required the bishops and clergy to revise the translation of the New Testament, which, for that purpose, was divided into fourteen parts, and portioned out to fifteen bishops; the Apocalypse, on account of its difficulty, being assigned to two. Gardiner clogged this business with embarrassing instructions, and Cranmer, clearly perceiving the resolution of the bishops to defeat the proposed translation, procured the king's consent to refer the matter to the two universities, against which the bishops protested; but the archbishop declared his purpose to adhere to the will of the king. With this contest the business terminated; and the convocation was soon after dissolved. The Romish party prevailed also in parliament, which enacted a law that condemned and abolished Tindal's translation, and allowed other translations to remain in force, under certain restrictions. After the passing of this act, Grafton, the king's printer, was imprisoned; nor was he released without giving a bond of £300 neither to print nor sell any more English Bibles, till the king and the clergy should agree on a translation. In 1544 the Pentateuch was printed by John Day and William Seres; and in 1546 the king prohibited by proclamation the having and reading of Wickliffe's, Tindal's, and Coverdale's translations, and forbad the use of any other than what was allowed by parliament.

Soon after the accession of Edward VI. the stat. 34 and 35 Henry VIII. c. 1 was repealed, and a royal injunction was published, that not only the whole English Bible should be placed in churches, but also the paraphrase of Erasmus in English to the end of the four evangelists. It was likewise ordered, that every parson, vicar, curate, &c., under the degree of a bachelor of divinity, should possess the New Testament, both in Latin and English, with the paraphrase of Erasmus upon it; and that the bishops, &c., in their visitations and synods should examine them, how they had profited in the study of the Holy Scriptures. It was also appointed, that the epistle and gospel of the mass should be read in English; and that on every Sunday and holiday, one chapter of the New Testament in English should be plainly and distinctly read at matins, and one chapter of the Old Testament at even-song. During the course of this reign eleven impressions of the whole English Bible were published, and six of the English New Testament; besides an English translation of the whole New Testament, paraphrased by Erasmus. The Bibles were reprinted, according to the preceding editions, whether Tindal's, Coverdale's, Matthew's, Cranmer's, or Taverner's; that is, with a different text, and different notes. But it is doubted, in the preface to king James's translation, whether there were any translation, or correction of a translation, made by king Edward's divines.

In 1562 the 'Great Bible,' viz. that of Coverdale's translation, which had been printed in the time of Henry VIII. and also in the time of king Edward, was revised by archbishop Parker, and reprinted for the use of the church; and this was to serve till that projected by his grace was ready for publication.

The English reformers, driven to Geneva, during the persecutions of queen Mary's reign, published, in 1557, an English New Testament, printed by Conrad Badius; the first in our language which contained the distinction of verses by numerical figures, after the manner of the Greek Testament, which had been published by Robert Stephens in 1551. R. Stephens, indeed, published his figures in the margin; whereas the Geneva editors prefixed theirs to the beginning of minute subdivisions with breaks, after our present manner.

In 1560 the whole Bible in 4to. was printed at Geneva by Rowland Harle; some of the refugees from England continuing in that city for this purpose. The translators were bishop Coverdale, Anthony Gilby, William Whittingham, Christopher Woodman, Thomas Sampson, and Thomas Cole; to whom some add John Knox, John Bodleigh, and John Pullain; all zealous Calvinists, both in doctrine and discipline: but the chief and the most learned of them were the three first. Professing to observe the sense, and to adhere as much as possible to the words of the original, and in many places to preserve the Hebrew phraseology, after the unremitting labor and study of more than two years, they finished their translation, and published it; with an epistle dedicatory to the queen, and another, by way of preface, to their brethren of England, Scotland, and Ireland. Besides the translation, the editors of the Geneva Bible noted in the margin the diversities of speech and reading, especially according to the Hebrew; they inserted in the text, with another kind of letter, every word that seemed to be necessary for explaining any particular sentence; in the division of the verses, they followed the Hebrew examples, and added the number to each verse; they also noted the principal matters, and the arguments, both for each book and each chapter; they set over the head of every page some remarkable word or sentence, for helping the memory; they introduced brief annotations for ascertaining the text, and explaining obscure words; they set forth with figures certain places in the books of Moses, of the Kings, and Ezekiel, which could not be made intelligible by any other description; they added maps of divers places and countries, mentioned in the Old and New Testament; and they annexed two tables, one for the interpretation of Hebrew names, and the other containing all the chief matters of the whole Bible. Of this translation, there were above thirty editions in folio, 4to., or 8vo., mostly printed by the queen's and king's printer, between the years 1560 and 1616. Editions of it were likewise printed at Geneva, Edinburgh, and Amsterdam. To some editions of the Geneva Bible (as to those of 1599 and of 1611) is subjoined Beza's translation of the New Testament, Englished by L. Tompson.

In the year 1568 the Bible, proposed by

archbishop Parker three years before, was completed. This edition, according to Le Long, was undertaken by command of queen Elizabeth; and it is mentioned by Strype, to the honor of the archbishop, that he had resolution to perform what Cranmer, as opposed by the bishops of his days, had in vain endeavoured to accomplish. In this performance, distinct portions of the Bible, at least fifteen in number, were allotted to select men of learning and abilities, appointed, as Fuller says, by the queen's commission; and, accordingly, at the conclusion of each part, the edition of 1568 has the initial letters of each man's name to the end of the first epistle to the Corinthians; e. g. at the end of the Pentateuch, W. E. for William, bishop of Exeter, whose allotment ended there; at the end of Ruth, R. M. for Richard Menevensis, or bishop of St. David's, to whom pertained the second allotment; and so of the rest. But it still remains uncertain, who, and whether one or more, revised the rest of the New Testament. Eight of the persons employed were bishops; whence the book was called the 'Bishops' Bible,' and the 'Great English Bible.' The archbishop employed other critics to compare this Bible with the original languages, and with the former translations; one of whom was Laurence, a man famous in those times for his knowledge of the Greek, whose castigations the Bishops' Bible followed exactly. His grace also sent instructions concerning the method which his translators were to observe; and recommended the addition of some short marginal notes, for the illustration or correction of the text. But the particulars of these instructions are not known. This Bible was printed and published in 1568, in a large folio size, and with a beautiful English letter, on royal paper; and embellished with several cuts of the most remarkable things in the Old and New Testaments, and in the Apocrypha, with maps cut in wood, and other engravings on copper. It has numerous marginal references and notes, and many useful tables. It also has numerous insertions between brackets, and in a smaller character; which are equivalent to the italics afterwards used by James's translators. Dr. Geddes is of opinion, that italic supplements were first used by Arius Montanus, who died in 1598. The several additions from the vulgar Latin, inserted in the Great Bible, are omitted; and verse 7 of 1 John v. which was before distinguished by its being printed in a different letter, is here printed without any distinction; and the chapters are divided into verses. In the following year, 1569, it was again published in large 8vo., for the use of private families. This Bible was re-printed in 1572, in large folio, with several corrections and amendments, and several prolegomena; this is called Matthew Parker's Bible.

In the year 1582 the Romanists first printed an English New Testament at Rheims: it was translated, not from the original Greek, but from the Latin Vulgate. The editors (whose names are not known) retained the words azymes, tunike, holocaust, pasche, and a multitude of other Greek words untranslated, under the pretext of wanting proper and adequate English terms, by which to render them; and thus contrived to render it unintelligible to common readers. Hence the historian Fuller took occasion to remark that it was 'a translation which needed to be translated;' and that its editors, 'by all means labored to suppress the light of truth under one pretence or other.' Our learned countryman, Thomas Cartwright, was solicited by Sir Francis Walsingham, to refute this translation; but, after he had made considerable progress in the work, he was prohibited from proceeding further by archbishop Whitgift; who, judging it improper that the defence of the doctrine of the Church of England should be committed to a puritan, appointed Dr. William Fulke in his place. By him the divines of Rheims were refuted with great spirit and ability. Fulke's work appeared in 1617; and, in the following year, Cartwright's confutation was published under the auspices of archbishop Abbot; both of them were accompanied with the Rhemish translation of the New Testament. The Old Testament was translated from the Vulgate at Douay (whence it is called the Douay Bible), in two volumes 4to., the first of which appeared in 1609, and the second in 1610. Annotations are subjoined, which are ascribed to one Thomas Worthington; the translators were William (afterwards cardinal) Allen, Gregory Martin, and Richard Bristow. This translation, with the Rhemish version of the New Testament above noticed, forms the English Bible, which alone is used by the Romanists of this country.

The only English version that remains to be noticed, is the authorised translation now in use, which is commonly called King James's Bible.

A resolution being formed, in consequence of a request made by Dr. Reynolds, head of the Nonconformist party, to king James I. in the conference held at Hampton Court, 1603, that a new translation, or rather a revision of what was called the Bishops' Bible, printed in 1568, should be made, fifty-four translators, divided into six classes, were appointed for the accomplishment of this important work. Seven of these appear to have died before the work commenced, as only forty-seven are found in Fuller's list. The names of the persons, the places where employed, and the proportion of work allotted to each class, and the rules laid down by king James for their direction, we give chiefly from Fuller's Church History, book x. p. 44, &c.

Dr. Reynolds's request in the Hampton Court conference, and king James's answer, were as follows:

*Dr. Reynolds.*—May your majesty be pleased that the bible be new translated: such as are extant not answering the original. [Here he gave a few examples.]

*Bishop of London*—If every man's humor might be followed, there would be no end of translating.

*The King.*—I profess I could never yet see a bible well translated in English; but I think, that of all, that of Geneva is the worst. I wish some special pains were taken for a uniform translation, which should be done by the best learned in both universities; then reviewed by the bishops; presented to the Privy Council; lastly, ratified by royal authority, to be read in the whole Church, and no other.

The bishop of London in this, as in every

other case, opposed Dr. Reynolds, till he saw that the project pleased the king, and that he appeared determined to have it executed. In consequence of this resolution, the following learned and judicious men were chosen for the execution of the work:

WESTMINSTER, 10.—The PENTATEUCH: the Story from JOSHUA, to the first book of the CHRONICLES, exclusively.

Dr. Andrews, fellow and master of Pembroke Hall, in Cambridge; then dean of Westminster, afterwards bishop of Winchester.
Dr. Overall, fellow of Trinity College, master of Katharine Hall, in Cambridge; then dean of St. Paul's, afterwards bishop of Norwich.
Dr. Saravia.
Dr. Clarke, fellow of Christ College, in Cambridge, preacher in Canterbury.
Dr. Laifield, fellow of Trinity, in Cambridge, parson of St. Clement Danes. Being skilled in architecture, his judgment was much relied on for the fabric of the tabernacle and temple.
Dr. Leigh, archdeacon of Middlesex, parson of All-hallow's, Barking.
Master Burgley.
Mr. King.
Mr. Thompson.
Mr. Bedwell, of Cambridge, and (we think) of St. John's, vicar of Tottenham, nigh London.

CAMBRIDGE, 8.—From the first of the CHRONICLES, with the rest of the Story, and the HAGIOGRAPHA, viz. JOB, PSALMS, PROVERBS, CANTICLES, and ECCLESIASTES.

Master Edward Lively.
Mr. Richardson, fellow of Emmanuel, afterwards D. D., master, first of Peter House, then of Trinity College.
Mr. Chaderton, afterwards D. D. fellow, first of Christ College, then master of Emmanuel.
Mr. Dillingham, fellow of Christ College, beneficed at ———, in Bedfordshire, where he died a single and a wealthy man.
Mr. Andrews, afterwards D. D. brother to the bishop of Winchester, and master of Jesus College.
Mr. Harrison, the Rev. vice-master of Trinity College.
Mr. Spalding, fellow of St. John's, in Cambridge, and Hebrew professor therein.
Mr. Bing, fellow of Peter House, in Cambridge, and Hebrew professor therein.

OXFORD, 7.—The four greater PROPHETS, with the LAMENTATIONS, and the twelve lesser PROPHETS.

Dr. Harding, president of Magdalen College.
Dr. Reynolds, president of Corpus Christi College.
Dr. Holland, rector of Exeter College, and King's professor.
Dr. Kilby, rector of Lincoln College, and Regius professor.
Master Smith, afterwards D. D. and bishop of Gloucester. He made the learned and religious preface to the translation.
Mr. Brett, of a worshipful family, beneficed at Quainton, in Buckinghamshire.
Mr. Fairclowe.

CAMBRIDGE, 7.—The Prayer of MANASSEH, and the rest of the APOCRYPHA.

Dr. Duport, Prebend of Ely, and master of Jesus College.
Dr. Brainthwait, first, fellow of Emmanuel, then master of Gonvil and Caius Colleges.
Dr. Radclyffe, one of the senior fellows of Trinity College.
Master Ward, Emmanuel, afterwards D.D. master of Sidney College, and Margaret professor.
Mr. Downs, fellow of St. John's College, and Greek professor.
Mr. Boyce, fellow of St. John's College, prebend of Ely, parson of Boxworth in Cambridgeshire
Mr. Ward, regal, afterwards D. D. prebend of Chichester, rector of Bishop Waltham, in Hampshire

OXFORD, 8.—The four GOSPELS, ACTS of the APOSTLES, and APOCALYPSE.

Dr. Ravis, dean of Christ Church, afterwards bishop of London.
Dr. Abbot, master of University College, afterwards archbishop of Canterbury.
Dr. Eedes.
Mr. Thomson.
Mr. Savill.
Dr. Peryn.
Dr. Ravens.
Mr. Harmer.

WESTMINSTER, 7.—The EPISTLES of ST. PAUL, and the CANONICAL EPISTLES.

Dr. Barlowe, of Trinity Hall, in Cambridge, dean of Chester, afterwards bishop of Lincoln.
Dr. Hutchenson.
Dr. Spencer.
Mr. Fenton.
Mr. Rabbet.
Mr. Sanderson.
Mr. Dakins.

For the better ordering of their proceedings, his Majesty recommended the following rules, to be most carefully observed by them:

1. The ordinary bible read in the church, commonly called the Bishops' Bible, to be followed, and as little altered as the original will permit.

2. The names of the prophets, and the holy writers, with their other names in the text, to be retained as near as may be, accordingly as they are vulgarly used.

3. The old ecclesiastical words to be kept, viz. as the word *church* not to be translated *congregation*, &c.

4. When any word hath divers significations, that to be kept which hath been most commonly used by the most eminent fathers, being agreeable to the propriety of the place, and the analogy of faith.

5. The division of the chapters to be altered either not at all, or as little as may be, if necessity so require.

6. No marginal notes at all to be affixed, but only for the explanation of the Hebrew or Greek words, which cannot, without some circumlocution, so briefly and fitly be expressed in the text.

7. Such quotations of places to be marginally set down, as shall serve for the fit reference of one Scripture to another.

8. Every particular man of each company to take the same chapter, or chapters; and having translated or amended them severally by himself, where he thinks good, all to meet together, confer what they have done, and agree for their part what shall stand.

9. As any one company hath despatched any one book in this manner, they shall send it to the rest, to be considered of seriously and judiciously; for his Majesty is very careful in this point.

10. If any company, upon the review of the book so sent, shall doubt, or differ upon any places, to send them word thereof, note the places, and therewithal send their reasons: to which, if they consent not, the difference to be compounded at the general meeting, which is to be of the chief persons of each company, at the end of the work.

11. When any place of special obscurity is doubted of, letters to be directed by authority, to send to any learned in the land, for his judgment in such a place.

12. Letters to be sent from every bishop to the rest of his clergy, admonishing them of this translation in hand; and to move and charge as many as, being skilful in the tongues, have taken pains in that kind, to send his particular observations to the company, either at Westminster, Cambridge, or Oxford.

13. The directors in each company to be the deans of Westminster and Chester for that place, and the King's professors in Hebrew and Greek in each university.

14. These translations to be used, when they agree better with the text than the bishop's bible, viz. Tindal's, Matthews', Coverdale's, Whitchurch, Geneva.

Besides the said directions before-mentioned, three or four of the most ancient and grave divines in either of the universities, not employed in translating, to be assigned by the vice-chancellor upon conference with the rest of the heads, to be overseers of the translations, as well Hebrew as Greek, for the better observation of the fourth rule above specified.

'And now after long expectation and great desire,' says Mr. Fuller, 'came forth the new translation of the bible (most beautifully printed) by a select and competent number of divines appointed for that purpose; not being too many, lest one should trouble another; and yet many, lest many things might haply escape them. Who neither coveting praise for expedition, nor fearing reproach for slackness (seeing in a business of moment, none deserve blame for convenient slowness), had expended almost three years in the work, not only examining the channels by the fountain, translations with the original, which was absolutely necessary, but also comparing channels with channels, which was abundantly useful in the Spanish, Italian, French and Dutch (German) languages.—These, with Jacob, rolled away the stone from the mouth of the well of life: so that now, even Rachel's weak women may freely come both to drink themselves, and water the flocks of their families at the same. Leave we then, those worthy men now all gathered to their fathers, and gone to God, however they were requited on earth, well rewarded in heaven for their worthy work. Of whom, as also of that gracious king that employed them, we may say, Wheresoever the Bible shall be preached or read in the whole world, there shall also this that they have done be told in memorial of them.'

This Bible was begun in 1607, but was not completed and published till 1611; and there are copies of it which, in their title pages, have the dates 1612 and 1613. This translation was corrected, and many parallel texts added, by Dr. Scattergood, in 1683; by Dr. Lloyd, bishop of London, in 1701; and afterwards by Dr. Paris, at Cambridge; but the most complete revision was made by Dr. Blayney, in the year 1769, under the direction of the vice-chancellor and delegates of the university of Oxford; in which, 1. The punctuation was thoroughly revised. 2. The words printed in italics examined, and corrected by the Hebrew and Greek originals. 3. The proper names, to the etymology of which allusions are made in the text, translated, and entered in the margin. 4. The heads and running titles corrected. 5. Some material errors in the chronology rectified; and 6. The marginal references re-examined, corrected, and their number greatly increased. Copies of this revision are those which are termed, above, the most correct copies of the present authorised version.

'Those who have compared most of the European translations with the original,' says Dr. A. Clarke, 'have not scrupled to say, that the English translation of the Bible, made under the direction of king James the First, is the most accurate and faithful of the whole. Nor is this its only praise: the translators have seized the very spirit and soul of the original, and expressed this almost every where with pathos and energy. Besides our translators have not only made a

standard translation, but they have made their translation the standard of our language: the English tongue in their day was not equal to such a work—'but God enabled them to stand as upon mount Sinai,' to use the expression of a learned friend, 'and *crane up* their country's language to the dignity of the originals, so that after the lapse of 200 years, the English Bible is, with very few exceptions, the standard of the purity and excellence of the English tongue. The original from which it was taken, is, alone, superior to the Bible translated by the authority of king James.' This is an opinion, in which my heart, my judgment, and my conscience coincide.'

We might add numerous similar testimonies, but must restrict ourselves to those of the learned layman Selden, bishop Walton, bishop Horsley, Dr. Geddes, a Catholic, and Dr. Doddridge, the celebrated dissenting commentator.

JOHN SELDEN. 'The English translation of the Bible is the best translation in the world, and *renders the sense of the original best, taking in for the English translation the Bishops' Bible as well as king James's*. The translators in king James's took an excellent way. That part of the Bible was given to him, who was most excellent in such a tongue: as the Apocrypha to Andrew Downs; and then they met together, and one read the translation, the rest holding in their hands some Bible, either of the learned tongues, or French, Spanish, Italian, &c. If they found any fault, they spoke; if not, he read on. There is no book so translated as the Bible for the purpose. If I translate a French book into English, I turn it into English phrase, not into French-English. *Il fait froid*; I say, *'tis cold*, not, *makes cold*. But the Bible is rather translated into English words than into English phrase. *The Hebraisms are kept, and the phrase of that language is kept*.'

BISHOP WALTON.—'The last English translation made by divers learned men at the command of king James, though it may justly contend with any now extant in any other language in Europe, was yet carped and cavilled at by divers among ourselves; especially by one, who being passed by, and not employed in the work, as one, though skilled in the Hebrew, yet of little or no judgment in that or any other kind of learning, was so highly offended that he would needs undertake to show *how many thousand places they had falsely rendered, when as he could hardly make good his undertaking in any one!*'

BISHOP HORSLEY.—'When the translators in James the First's time began their work, they prescribed to themselves some rules, which it may not be amiss for all translators to follow. Their reverence for the sacred Scriptures induced them to be as literal as they could, to avoid obscurity; and, it must be acknowledged, that they were extremely happy in the simplicity and dignity of their expressions. *Their adherence to the Hebrew idiom is supposed at once to have enriched and adorned our language*; and, as they labored for the general benefit of the learned and the unlearned, they avoided all words of Latin original, when they could find words in their own language, even with the aid of adverbs and prepositions, which would express their meaning.'

DR. GEDDES.—'The highest eulogiums have been made on the translation of James the First, both by our own writers and by foreigners. And indeed, if accuracy, fidelity, and the strictest attention to the letter of the text, be supposed to constitute the qualities of an excellent version, *this of all versions must, in general, be accounted the most excellent*. Every sentence, every word, every syllable, every letter and point, seem to have been weighed with the nicest exactitude, and expressed either in the text, or margin, with the greatest precision. Pagninus himself is hardly more literal; and it was well remarked by Robertson, above a hundred years ago, *that it may serve for a lexicon of the Hebrew language, as well as for a translation*.'

DR. DODDRIDGE.—'On a diligent comparison of our translation with the original, we find that of the New Testament, and I might also add that of the Old, in the main, faithful and judicious. You know, indeed, that we do not scruple, on some occasions, to animadvert upon it; but you also know, that these remarks affect not the fundamentals of religion, and seldom reach any further than the beauty of a figure, or at most the connexion of an argument.'

ENGLISH COVE, a bay or harbour on the south-west coast of New Ireland, so called by captain Carteret, who anchored here in 1767. Oysters and cockles of large size are found among the rocks, and fish are every where plentiful. Scorpions, centipedes, and snakes, were also seen; with abundance of vegetables. The trees grow to an enormous size: the cocoa-nut and the wild nutmeg are in great perfection. Here is also a large blackbird, whose cry resembles the barking of a dog. Two small quadrupeds, supposed to be dogs, were observed by Carteret; and some deserted huts, but none of the natives were seen. Seven miles N.N.W. of Cape St. George.

ENGLISH HARBOUR, one of the best harbours of the island of Antigua, on the south shore, a mile south-east of the mouth of Falmouth harbour. It is fortified, and has a royal navy-yard and arsenal, with conveniences for careening ships of war. Long. 61° 27′ 30″ W., lat. 17° 8′ 25″ N.

ENGLISH ISLAND, or Long Island, a small island on the coast of Natolia, at the entrance of the gulf of Smyrna, so called from certain Englishmen who landed for amusement having been murdered here. Long. 26° 24′ E. lat. 38° 38′ N.

ENGLISH LANGUAGE. See GRAMMAR and LANGUAGE

ENGLISH LITURGY. The history of the present liturgical service of the Church of England may be thus concisely presented to the reader.

Prior to the reign of Henry VIII. the whole liturgy of the Church was sung or said in Latin; but in 1536 he ordered the apostles' creed, the Lord's prayer, and the ten commandments, to be translated into English for the use of the common people. 'In 1545 the liturgy was also permitted in English,' says Fuller, 'and this was the farthest pace the reformation stept in the reign of Henry the Eighth.'

In the first year of Edward VI., 1547, it was recommended to certain grave and learned

bishops and others, then assembled by order of the king, at Windsor Castle, to draw up a communion service, and to revise and reform all other offices in the divine service: this service was accordingly printed and published, and strongly recommended by special letters from Seymour, lord protector, and the other lords of the council. The persons who compiled this work were the following:—

1. Thomas Cranmer, archbishop of Canterbury.
2. George Day, bishop of Chichester.
3. Thomas Goodrick, bishop of Ely.
4. John Skip, bishop of Hereford.
5. Henry Holbeach, bishop of Lincoln.
6. Nicholas Ridley, bishop of Rochester.
7. Thomas Thirlby, bishop of Westminster.
8. Doctor May, dean of St. Paul's.
9. John Taylor, then dean, afterwards bishop of Lincoln.
10. Doctor Haines, dean of Exeter.
11. Doctor Robinson, afterwards dean of Durham.
12. Doctor John Redman, master of Trinity College, Cambridge.
13. Doctor Richard Cox, then almoner to the king, and afterwards bishop of Ely.

This was what Fuller calls the first edition of the Common Prayer. Some objections having been made to this work by Calvin abroad, and some learned men at home, particularly in reference to the Commemoration of the Dead, the use of Chrism, and extreme Unction, it was ordered by a statute in parliament (5 and 6 of Edward VI.), that it should be faithfully and godly perused, explained, and made fully perfect. The chief alterations made in consequence of this order were these: the General Confession and Absolution were added, and the Communion Service was made to begin with the Ten Commandments; the use of oil in confirmation and extreme unction was left out, also Prayers for the Dead; and certain expressions that had a tendency to countenance the doctrine of transubstantiation. The same persons to whom the compiling of the Communion Service was entrusted, were employed in this revision, which was completed and published in 1548. On the accession of queen Mary, this Liturgy was abolished, and the Prayer Book, as it stood in the last year of Henry VIII., commanded to be used in its place. In the first year of the reign of queen Elizabeth, 1559, the former Liturgy was restored, but it was subjected to a further revision, by which some few passages were altered, and the petition in the Litany, for being delivered from the tyranny, and all the detestable enormities of the bishop of Rome, left out, in order that conscientious Catholics might not be prevented from joining in the common service. This being done, it was presented to parliament, and by them received and established, and the act of uniformity, which is usually printed with the Liturgy, published by the queen's authority, and sent throughout the nation. The persons employed in this revision were the following:—

1. Master Whitehead, once chaplain to queen Anna Bullein
2. Matthew Parker, afterwards archbishop of Canterbury.
3. Edmund Grindall, afterwards bishop of London.
4. Richard Cox, afterwards bishop of Ely.
5. James Pilkington, afterwards bishop of Durham.
6. Doctor May, dean of St. Paul's and master of Trinity College, Cambridge.
7. Sir Thomas Smith, principal secretary of state.

Of these Drs. Cox and May were employed on the first edition of this work, as appears by the preceding list.

In the first year of king James, 1604, another revision took place, and a few alterations were made, which consisted principally in the addition of some prayers and thanksgivings, some alteration in the rubrics relative to the Absolution, to the Confirmation, and to the office of Private Baptism, with the addition of that part of the Catechism which contains the Doctrine of the Sacraments. The other additions were A Thanksgiving for diverse Benefits—A Thanksgiving for Fair Weather—A Thanksgiving for Plenty—A Thanksgiving for Peace and Victory, and A Thanksgiving for Deliverance from the Plague. See the Instrument in Rymer, vol. xvi. p. 565, &c. When the work was thus completed, a royal proclamation was issued, bearing date March 1st, 1604, in which the king gave an account of the Hampton Court Conference, the alterations that had been made by himself and his clergy in the book of Common Prayer, commanding it, and none other, to be used throughout the kingdom. See the Instrument, Rymer, vol. xvi. p. 575.

In this state the book of Common Prayer continued till the reign of Charles II. who, the 25th of October, 1660, granted his commission under the great seal of England, to several bishops and divines, to review the book of Common Prayer, and to prepare such alterations and additions as they thought fit to offer. In the following year the king assembled the convocations of both the provinces of Canterbury and York, and authorised the presidents of those convocations, and other, the bishops and clergy of the same, to review the said book of Common Prayer, &c., requiring them, after mature consideration, to make such alterations and additions as to them should seem meet and convenient. This was accordingly done: several prayers and some whole services added, and the whole published with the act of Uniformity in the 14th of Charles II. 1661; since which time it has undergone no farther revision.

English Neighbourhood, a settlement of the United States, in New Jersey, situated on the north-east branch of Hackinsack River.

English Point, a cape in the river St. Lawrence on the coast of Canada. Long. 51° 45′ W., lat. 49° 40. N.—There is another cape of this name on the south coast of Newfoundland. Long. 53° 29′ W., lat. 46° 49′ N.

English Reach, a reach in the straits of Magellan, about nine miles across between Cape Holland and Cape Gallant.

English Road, a road in the island of Eooa or Middleburgh, in the South Pacific, with

wenty-five fathoms water. Long. 174° 34′ W., at. 21° 20′ S.

ENGLUT′, Fr. *engloutir*, a compound of en nd GLUT, which see. To swallow up; to fill; o pamper.

Whose grieved minds, which choler did *englut*,
Against themselves turning their wrathful spight.
*Spenser.*

Being once *englutted* with vanity, he will straightway loath all learning. *Ascham's Schoolmaster.*

Neither my place, nor ought I heard of business,
Hath raised me from my bed; nor doth the general
Take hold on me: for my particular grief
*Engluts* and swallows other sorrows. *Shakspeare.*
Certainly, thou art so near the gulf,
Thou needs must be *englutted*. *Id. Henry V.*

ENGO′RE, *v. a.* From en and gore. To pierce; to prick. Not used.

As savage bull, whom two fierce mastiffs bait,
When rancour doth with rage him once *engore*,
Forgets with wary ward them to await,
But with his dreadful horns them drives afore.

ENGORGE′, *v. a.* & *n.* Fr. *engorger;* Ital. *ingorgiare;* Lat. *ingurgitare*, from *in* and *gurges*, originally a whirlpool, and thence a devouring glutton. To swallow; devour: and, as a neuter verb, to feed voraciously; riot in food.

Then fraught with rancour and *engorged* ire,
He cast at once him to avenge for all. *Spenser.*
That is the gulf of greediness, they say,
That deep *engorgeth* all this world is prey. *Id.*
Greedily she *engorged* without restraint,
And knew not eating death.
*Milton's Paradise Lost.*

ENGRAFT, *v. a.* } From en and GRAFT,
ENGRAFT′ED. } which see. To insert a cion into the stock or stem of a plant: graft is the more common verb.

Real friendship is a slow grower; and never thrives, unless *engrafted* upon a stock of known and reciprocal merit. *Chesterfield.*

ENGRA′IL, *v. a.* From Fr. *grele*, hail. To variegate; to spot as with hail. A word now used only in heraldry, for to indent in curve lines.

Æacides then shews
A long lance, and a caldron, new, *engrailed* with
twenty hues. *Chapman's Iliad.*
Polwheel beareth a saultier *engrailed*. *Carew.*

ENGRAILED, a line of partition, by which ordinaries are diversified, composed of semicircles, the teeth or points of which enter the field. As argent, a bordure engrailed, azure; name, Bird.

ENGRA′IN, *v. a.* From en and grain. To die deep; to die in grain.

See thou how fresh my flowers being spread,
Dyed in lilie white and crimson red,
With leaves *engrained* in lusty green. *Spenser.*

ENGRAP′PLE, *v. a.* From en and grapple. To close with: to contend with: hold on each other.

There shall young Hotspur, with a fury led,
*Engrapple* with thy son, as fierce as he.

ENGRAPPLE, in naval warfare, is a manœuvre designed to retain an enemy's vessel in some perpendicular position for the purpose of boarding. When an opportunity offers of grappling across a ship's bows, or stern, so as to allow raking her fore and aft, the battle is usually but of short duration; it being nearly impossible for a crew to stand to their guns while subject to so destructive a fire. Generally when a commander is intent on boarding his opponent, he has his yard-arms supplied with small grapnails, which, being lowered down at pleasure, hook in amongst the enemy's rigging, and thus prevent her from retiring to avoid the boarders. Sometimes poles, having long barbs at their ends, are used for the same purpose; these are chiefly managed by the forecastle men, and have their butts lashed to the davit, or to the cat-head. Whatever contrivance may be in use for engrappling, it is expedient that the implement be every where sufficiently solid or firm to retain its hold, and to resist the hatchet, otherwise it will be speedily cut away; thus, all grapnails should be suspended by means of chains, passed through blocks at the yard-arms; nor should the tackle, by which they are acted upon, be hauled tight until the points of the grapnails may be firmly hooked among the shrowd-hawsers, or some such substantial part of the enemy's rigging, which he could not with safety to his masts or yards, cut away. Where it is practicable, a very strong chain is passed round the whole of the shrowd-hawsers of that mast, respectively, opposite which the vessel is engrappled; or, if that be too hazardous, the chain-plates may be secured in a similar manner. It is evident, that were the former to be all included, the enemy must cut away every support on that side his mast, before he could extricate himself; in the latter instance, as the chain-plates are of iron, and very substantial, nothing but the chain, whereby they are embraced, giving way, could afford the means of separation.

Ships sometimes become fortuitously engrappled, by the flukes of their anchors hooking among the rigging of the vessels opposed to them; this however, is seldom permanent; for, as the engrappling arises from accident, a lift, or heave of the sea, will ordinarily set the parties at liberty, either by tearing away whatever hitches upon the fluke, or by causing the latter to unhook itself. It should ever be well considered by a commander, how far the safety of his ship may become questionable in the attempt to approach his opponent, when there is much swell. The practice of engrappling is, indeed, but rarely resorted to in ships of the line, or even by frigates; but is extremely common among privateers.

ENGRA′SP, *v. a.* From en and grasp. To seize; to hold fast in the hand; to gripe.

Now 'gan Pyrocles wax as wood as he,
And him affronted with impatient might;
And both together fierce *engrasped* he,
Whiles Guyon standing by, their uncouth strife does
see. *Spenser.*

ENGRA′VE, *v. a.* } Fr. *engrever;* Belg. and
ENGRA′VER, *n. s.* } Teut. *greven;* Sax. ᵹꞃaven, ᵹꞃapan, to excavate or dig out. To cut or score into; hence to depict on copper or other hard materials; to impress; imprint: and, in an obsolete sense, to put into a grave; to inter.

*Engrave* the two stones with the names.
*Exodus* xxviii. 11.

Her ivory forehead, full of bounty brave,
Like a broad table, did itself dispread,
For love his lofty triumphs to *engrave*,
And write the battle of his great godhead.
*Faerie Queene.*

The son had charge of them, now being dead,
In seemly sort their corses to *engrave*,
And deck with dainty flowers their bridal bed.
*Spenser.*

At first he *engraved* his image in the table of man's heart; Adam blurred the image, but, through God's mercy, saved the tablet. *Bp. Hall's Contemplations.*

(Moses) more hates the golden calf, wherein he sees *engraven* the idolatry of Israel, than he honours the tables of stone, wherein God had *engraven* his commandments. *Id.*

Images are not made in the brain itself, as the pencil of a painter or *engraver* makes the images in the table, but are imprinted in a wonderful method in the soul. *Hale.*

As touching traditional communication, and tradition of those truths that I call connatural and *engraven*, I do not doubt but many of those truths have had the help of that derivation. *Id. Origin of Mankind.*

It will scarce seem possible that God should *engrave* principles, in men's minds, in words of uncertain signification. *Locke.*

We may as well think the use of reason necessary to make our eyes discover visible objects, as that there should be need of reason, or the exercise thereof, to make the understanding see what is originally *engraven* in it, and cannot be on the understanding, before it be perceived by it. *Id.*

O'er all, the heaven's refulgent image shines;
On either gate were six *engraven* signs. *Addison.*

Our Saviour makes this return, fit to be *engraven* in the hearts of all promoters of charity. *Atterbury.*

Names fresh *engraved* appeared of wits renowned;
I looked again, nor could their trace be found.
*Pope.*

Words of eternal truth proclaim,
All mortal joys are vain:
A diamond pen *engraves* the theme
Upon a brittle pane.
*Watts on a Pane of Glass.*

Thy saints proclaim thee king; and in their hearts
Thy title is *engraven* with a pen
Dipped in the fountain of eternal love. *Cowper.*

His brow was like the deep when tempest-tost;
Fierce and unfathomable thoughts *engraved*
Eternal wrath on his immortal face,
And where he gazed a gloom pervaded space.
*Byron.*

Engraving is, more particularly, the art of depicting by incisions, in any matter or substance, but particularly on plates of metal, blocks of wood, hard stones, &c., for the purpose of producing certain impressions from them, which are called prints. It is divided into several other branches, or classes, according to the matter on which it is performed, and the manner of execution: as engraving on stones for seals, signets, &c., which is called gem sculpture; die sinking for coins, medals, &c., called medallurgy; on copper and steel plates, after various modes, as line engraving, etching or engraving by the aid of aquafortis, mezzotinto engraving or scraping, aquatinta engraving, stipple or dot, which is a manner of engraving in imitation of chalk; engraving on wood, on steel, on glass by means of fluoric acid, on stone called lithography, and some other minor branches of the same art. See Gem Sculpture, Medallurgy, Etching, &c.

The importance and utility of engraving are acknowledged by every person of taste and knowledge, and its rank among the fine arts is high and indisputable. It multiplies the works of other artists and preserves them to posterity, and records the talents of eminent artists by an art which requires equal talent and scarcely less genius. The hieroglyphics of the Egyptians, in the British museum, are also a species of engraving; and among the Etruscan antiquities in that collection are two specimens of the art executed at a very remote period, a representation of which forms the frontispiece to one of the volumes of Strutt's Dictionary of Engravers.

The art of engraving is of high antiquity; it originally consisted of rude delineations, expressed by mere outlines, such as those which Herodotus describes as having been traced upon the shields of the Carians. Bezaleel and Aholiab are mentioned in the book of Exodus as 'filled with wisdom of heart to work all manner of work of the engraver.' The art of engraving seals or signets is also very ancient, and was practised by the earliest nations of antiquity. The earliest writers mention engraved seals and seal rings as among the most esteemed decorations of great personages; and there are still many of their works remaining equal to any production of the later ages.

Engraving, as now practised for the multiplication of copies by the means of printing from engraved plates and blocks of wood, is an art chiefly of modern invention; having its origin no earlier than the middle of the fifteenth century; and was unknown till after the invention of the art of painting in oil. The most ancient mode of obtaining prints or impressions on paper appears to have been from engraved or carved wooden blocks; therefore, engraving on wood for this purpose bears the palm of antiquity. For this invention we are indebted to the brief-mahlers, or manufacturers of playing cards, who practised the art in Germany about the beginning of the fifteenth century. To the same source may be traced the first idea of moveable types, which appeared not long after; for the brief-mahlers did not confine themselves entirely to the printing and painting of cards, but produced also subjects of a more devout nature; many of which, taken from the Scriptures, are still preserved in German libraries, with the explanatory text facing the figures: the whole engraved in wood. Thus a species of books was formed; of which Historia Sancti Johannis, Ejusque Visiones Apocalypticæ, and Historia Veteris et Novi Testamenti, which is known to collectors by the name of The Poor Man's Bible. These short mementos were printed only on one side, and two of them being pasted together had the appearance of a single leaf. The earliest of these wooden cuts that have reached our times is one representing St. Christopher carrying the infant Jesus over the sea, and bears the date of 1423. This curious relic of ancient art is preserved in a convent at Buxheim, near Menningen; it is of

a folio size, illuminated in the same manner as the playing cards; and at the bottom is the following inscription:-

Christopheri faciem, die quacunque tueris,
Illâ nempe die morte malâ non morieris.
Millesimo CCCC° XX° tertio.

On the invention of wooden types, that branch of the brief-mahlers' business, so far as it regarded the making of books, was gradually discontinued; but the art itself of engraving upon wood continued in an improving state; and towards the end of the fifteenth, and the beginning of the sixteenth, century, it became the custom of almost all the German painters to engrave copies of their designs on wood as well as on copper. Hence the freedom and artist-like character of the old engravers. The works of Albert Durer, in this style of engraving upon wood, are justly held in the highest esteem. Besides Germany, Italy, France, and Holland, have produced many eminent artists of this description; but for boldness of conception, and for spirit in the execution, the works of Christopher Jergher, who worked under the direction, and engraved from the works of Rubens, who doubtlessly occasionally assisted him, stand preeminent.

The invention of that species of the art which is distinguished by the appellation of chiaroscuro engraving, appears also to be justly claimed by the Germans, being first practised by Mair, an artist of that country; one of whose prints bears the date of 1499. Many admirable works of this kind have been produced in France; and in Italy, Parmigiano, Titian, and other great masters, have practised it with the greatest success. In Germany, about the year 1450, prints from engraved copper-plates first made their appearance. The earliest date known of a copper-plate is 1461; but however faulty the print may be in respect to drawing, or defective in point of taste, the mechanical part of the execution of it has by no means the appearance of being one of the earliest productions of the graver. There are also several other prints in select collections, evidently the work of the same master, in which the impressions are so neatly taken from the plates, and the engravings so clearly printed in every part, that, according to all appearance, they could not be executed in a much better manner in the present day, with all the conveniences which the copper-plate printers now possess, and the additional knowledge they must necessarily have acquired in the course of three centuries. We may therefore fairly conclude that if they were not the first specimens of the engravers' workmanship, they were much less the first efforts of the copper-plate printers' ability.

It is likewise to be observed, that Martin Schoen, who is said to have worked from 1460 to 1486, was apparently the scholar of Stoltzhirs; for he followed his style of engraving, and copied from him a set of prints, representing the passion of our Saviour. Now, allowing Stoltzhirs to have preceded his disciple only ten years, this carries the era of the art back to 1450, as was said above. There is no ground to suppose that it was known to the Italians till at least ten years afterwards. The earliest prints that are known to be theirs are a set of the seven planets and an almanack by way of frontispiece; on which are directions for finding Easter from 1465 to 1517 inclusive: and we may be assured, that the engravings were not antedated, as the almanack would have thus been less valuable. These prints must therefore have been executed in 1464, which is only four years later than the Italians claim. The three earliest Italian engravers are Maso, Finiguerra, a celebrated painter, Boticelli, and Baldini. If we are to refer these prints to any of the three, we shall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or in composition to those ascribed to Boticelli, which we know at least were designed by him; and, as Baldini is expressly said to have worked from the designs of Boticelli, it will appear most probable that they belong to Finiguerra. With respect to the invention of etching, it seems to be not well known to whom it is to be ascribed. One of the most early specimens is the print by Albert Durer, known by the name of the cannon, dated 1518, and thought by some, with little foundation, to have been worked on a plate of iron. Another etching by the same artist is Moses receiving the tables of the law, dated 1524. It was also practised in Italy soon after this by Parmigiano, in whose etchings we discover the hand of the artist working out a system as it were from his own imagination, and striving to produce the forms he wanted to express. We see the difficulty he labored under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no instruction; and that it was something entirely new to him. If the story is true, that he kept an engraver by profession in his house, the novelty of the art is rendered so much the more probable. He died in 1540. As to that species of engraving in which the modes of etching and cutting with the graver are united, it must have been found necessary immediately upon the invention of etching; it was, however, first carried to perfection by Gerard Audran, and is now almost universally practised, whether the work is in strokes or in dots. Engraving in dots, now called stippled engraving, is a very old invention, and the only mode discovered by the Italians. Agostino de Musis, commonly called Augustine of Venice, a pupil of Marc Antonio, used it in several of his earliest works, but confined it to the flesh, as in the undated print of an old man seated upon a bank, with a cottage in the back ground. He flourished from 1509 to 1536. We also find it in a print of a single figure standing, holding a cup and looking upwards, by Giulio Campagnola, who engraved about the year 1516. The back ground is executed with round dots, made apparently with a dry point. The figure is outlined with a stroke deeply engraved, and finished with dots, in a manner greatly resembling those prints which Demarteau engraved at Paris in imitation of red chalk. The hair and beard are expressed by strokes. Stephen de Laulne, a native of Germany, followed the steps of Cam-

pagnola; and many of his slight works are executed in dots only. John Boulanger, a French artist, who flourished in the middle of the last century, and his contemporary Nicholas Van Plattenberg, improved greatly on this method, and practised it with much success. It is only, however, of late, that it has been considered as an object worthy of general imitation. John Lutma executed this kind of work with a hammer and a small punch or chisel. Engraving in mezzotinto was invented about the middle of the seventeenth century; and the invention has generally been attributed to prince Rupert: but the editor of Parentalia (p. 214) asserts that Sir Christopher Wren was the first inventor of the art of graving in mezzotinto; which was afterwards prosecuted and improved by his royal highness prince Rupert. See also Elmes's Life of Wren, p. 108, where the same fact is also recorded. See MEZZOTINTO. Engraving in aquatinta was originally the invention of Le Prince, a French artist. His process was for a long time kept secret; and his prints, it is said, were at first sold for drawings. That he carried the art to a very great degree of perfection, seems evident, from the prints which he executed being still admired as the finest and best specimens of this mode of engraving. He appears, however, to have been only acquainted with the powdered grain, and the common method of stopping out. This art was first practised in England by Mr. Paul Sandby; and by him it is believed to have been communicated to Mr. Jukes, whose works display the proficiency that has been attained in aquatinta, which, though now generally practised all over Europe, is most successfully so in Britain. To the account we have given of this art under the article AQUATINTA, we shall add a few farther observations under the different modes of engraving on copper.

ENGRAVING ON COPPER.—The most ancient as well as the most legitimate and beautiful mode of practising the art, is that which is called line-engraving, or engraving proper; and is the art of cutting lines upon a copper-plate, by means of a steel instrument called a graver or burin, without the use of aqua-fortis. This was the first way of producing copper-plate prints that was practised, and is still much used in historical subjects, portraits, and in finishing landscapes. The tools necessary for this art are the graver or burin, of which there are various sorts, a scraper, a burnisher, an oil-stone, a sand-bag, or cushion for supporting the plate, an oil-rubber, and some good charcoal The graver is an instrument made of tempered steel, of the form of a quadrangular prism, about one-tenth of an inch thick, fitted into a short wooden handle. They are square and lozenge-shaped. The first are used in cutting broad strokes, the other for fainter and more delicate lines. In making the incision, it is pushed forward by the hand in the direction of the line required. The scraper is a three-edged tool, also of steel, about six inches long, having three sharp edges, and is used for rubbing off the burr or barb raised by the graver. The burnisher is about three inches long, and is used for softening or reducing lines that are two deep, or for burnishing out any scratches or holes in the copper: it is formed of hard steel rounded and polished. The oil-stone is for whetting the gravers, etching-points, &c. The sand-bag, or cushion, about nine inches diameter, is for laying the plate upon, for the conveniency of turning it in any direction, but is seldom used by artists. The oil-rubber and charcoal are for polishing the plate. As great attention is required to whet the graver, particularly the belly of it, care must be taken to lay the two angles of the graver, which are to be held next the plate, flat upon the stone, and to rub them steadily till the belly rises gradually above the plate; otherwise it will dig into the copper, and then it will be impossible to keep a point, or execute the work with freedom. For this purpose the right arm must be kept close to the side, and the fore finger of the left hand placed upon that part of the graver which lies uppermost upon the stone. In order to whet the face, the flat part of the handle should be placed in the hollow of the hand, with the belly of the graver upwards, upon a moderate slope, and the extremity rubbed upon the stone till it has an exceedingly sharp point. When the graver is too hard, as may be known by the frequent breaking of the point, it should be tempered by heating a poker red-hot, and holding the graver upon it, within half an inch of the point, till the steel changes to a light straw color; then put the point into oil to cool; or hold the graver close to the flame of a candle till it be of the same color, and cool it in the tallow. Be not hasty in tempering; for sometimes a little whetting will bring it to a good condition, when it is but a little too hard. To hold the graver cut off that part of the handle which is upon the same line with the belly, or sharp edge of the graver, making that side flat, that it may be no obstruction. Hold the handle in the hollow of the hand, and, extending your fore finger towards the point, let it rest on the back of the graver, that you may guide it flat and parallel with the plate.

To lay the design upon the plate, after you have polished it fine and smooth, heat it so that it will melt virgin wax; with which rub it thinly and equally over, and let it cool. Then the design which you are about to lay on must be drawn on paper with a black-lead pencil, and laid upon the plate with its penciled side upon the wax; then press it, and with a burnisher go over every part of the design, and when you take off the paper you will find all the lines which you drew with the black-lead pencil upon the waxed plate, as if it had been drawn on it; then with a sharp-pointed tool trace the design through the wax upon the plate, and you may then take off the wax, and proceed to work. Let the table or board you work at be firm and steady; upon which place your sand-bag with the plate upon it, and, holding the graver as before directed, proceed in the following manner:—For straight strokes move the right hand forwards, leaning lightly where the strokes should be fine, and harder where you would have them broader. For circular or crooked strokes hold the graver firmly, moving your hand or the plate as you see convenient. Learn to carry the hand with such dexterity, that you may end your stroke as finely as you began it; and if you have occasion to make

one part deeper or blacker than another, do it by degrees: and take care that your strokes be not too close nor too wide. In the course of your work scrape off the roughness which arises with your scraper, but be careful not to scratch the plate; and, that you may see your work properly as you go on, rub it with the oil-rubber, and wipe the plate clean, which takes off the glare of the copper, and shows what you have done to advantage. Any mistakes or scratches in the plate may be rubbed out with the burnisher, and the part levelled with the scraper, polishing it again lightly with the burnisher or charcoal. Having thus attained the use of the graver, according to the foregoing rules, you will be able to finish the piece by graving up the several parts, and advancing gradually with the stronger, till the whole is completed. The dry point, or needle (so called because not used till the ground is taken off the plate) is principally employed in the extremely light parts of water, sky, drapery, architecture, &c.

After all, in the conduct of the graver and dry point, it is difficult to lay down rules which shall lead to eminence in the art. Every thing seems to depend on the habit, disposition, and genius of the artist. A person cannot expect to excel very much in engraving who is not a good master of design, and he ought to be well acquainted with perspective, the principles of architecture, and anatomy. He will by these means be able, by proper gradations of strong and faint tints, to throw backward and bring forward the figures, and other objects of his picture or design, which he proposes to imitate. To preserve equality and union in his works, the engraver should always sketch out the principal objects of his piece before he undertakes to finish them. In addition to the rules already given, we may observe, that the strokes of the graver should never be crossed too much in the lozenge manner, particularly in the representations of muscles or flesh, because sharp angles produce the unpleasing effect of lattice-work, and take from the eye the repose which is agreeable to it in all kinds of picturesque designs. There are exceptions to this rule, as in the case of clouds, the representation of tempests, waves of the sea, the skins of hairy animals, or leaves of trees, in which this method of crossing may be admitted.

In managing the strokes, the actions of the figures, and of all their parts, should be considered, and, as in painting, it should be observed how they advance towards, or recede from the eye; and the graver must, of course, be guided according to the risings or the cavities of the muscles or folds, making the strokes wider and fainter in the light, and closer and firmer in the shades; thus the figures will not appear jagged, and the outlines may be formed and termin[illegible] without being cut too hard. However, tho[illegible] the strokes break off where the muscle be[illegible] yet they ought always to have a certain conn[illegible] with each other, so that the first stroke may of[illegible] serve, by its return, to make the second, w[illegible] will show the freedom and taste of the artist; [illegible] engraving the muscles of the human figu[illegible] effect may be produced in the lighter parts by what are called long pecks of the gravers, or by round dots, or by dots a little lengthened, or, what will be better, by a judicious mixture of these together. With regard to the hair, the engraver should begin his work by laying the principal grounds, and sketching the chief shades with a few strokes, which may be finished with finer and thinner strokes to the extremities. In the representation of architecture, the work ought not to be made too black, because as the edifices are usually constructed with stone, marble, &c., the color, being reflected on all sides, does not produce dark shade, as is the case of other substances. Where sculpture is to be represented, white points must not be put in the pupils of the eyes of the figures, and in engravings after paintings; nor must the hair or beard be represented as in nature, which makes the locks appear flowing in the air, because, as is evident, in sculpture there can be no such appearances.

For engraving a series of parallel lines, which are either all equidistant, or approximating towards each other in regular gradation, from a great to the most minute distance, such as the blue part of a sky, water, or in plates of machinery, architecture, &c., where a smooth flat tint is required, nothing has yet equalled the ruling-machine invented by the late Mr. Lowry, about thirty years since. They are thus described by Mr. Landseer, in his Lectures on Engraving, delivered at the Royal Institution in 1806, and since published:—'The next mode of engraving that solicits our attention is that invented by Mr. Wilson Lowry. It consists of two instruments, one for etching successive lines, either equidistant, or in just gradation, from being wide apart to the nearest approximation, ad infinitum; and another, more recently constructed, for striking elliptical, parabolical, and hyperbolical curves, and in general all those lines which geometricians call mechanical curves, from the dimensions of the point of a needle to an extent of five feet. Both of these inventions combine elegance with utility, and both are of high value, as auxiliaries of the imitative part of engraving; but as the auxiliaries of chymical, agricultural, and mechanical science, they are of incalculable advantage. The accuracy of their operation, as far as human sense, aided by the magnifying powers of glasses, enables us to say so, is perfect; and I need not describe the advantages that must result to the whole cycle of science from mathematical accuracy.' The whole of Mr. Lowry's works, as well as those of his school, are proofs of the accuracy of these opinions.

Mezzotinto Engraving, or Scraping.—This art, which is of modern date, is recommended by the ease with which it is executed, especially by those who understand drawing. Mezzotinto prints are those which have no strokes of the graver, but whose lights and shades are blended together, and appear like drawing in Indian ink. They are different from aquatinta, but, as both resemble Indian ink, the difference is more easily perceived than described. Mezzotinto is applied to portraits and historical subjects, and aquatinta is chiefly used for landscape and architecture. The tools necessary for mezzotinto scraping are the grounding tool, burnishers, and scrapers. To lay the mezzotinto ground, lay your plate, with

a piece of flannel under it, upon the table; hold the tool in your hand perpendicularly, lean upon it moderately hard, continually rocking your hand in a right line from end to end, till you have wholly covered the plate in one direction; next cross the strokes from side to side, afterwards from corner to corner, working the tool each time all over the plate in every direction, almost like the points of a compass; taking care not to let the tool cut (in one direction) twice in one place. This done, the plate will be full, and would, if it were printed, appear completely black. Having laid the ground, take the scrapings of black chalk, and with a piece of rag rub them over the plate, or the plate may be smoked with candles. Now take the drawing, and, having rubbed the back with red chalk-dust mixed with flake white, proceed to trace it on the plate. To form the lights and shadows, take a blunt needle and mark the outlines only, then scrape off the lights in every part of the plate as clean and smooth as possible, in proportion to the strength of the lights in your drawing, taking care not to hurt the outlines. The use of the burnisher is to soften the extreme light parts after the scraper is done with; such as the tip of the nose, forehead, linen, &c., which might otherwise, when proved, appear rather misty than clear.

Another method used by mezzotinto scrapers is to etch the outlines of the original, and the folds in drapery, making the breadth of the shadows by dots, which having bit to a proper depth, with aquafortis, they take off the ground used in etching, and having laid the mezzotinto ground, proceed to scrape as above described. When the plate is ready, send it to the copper-plate printer and get it proved. When the proof is dry, touch it with white chalk where it should be lighter, and with black chalk where it should be darker; and, when the print is retouched, proceed as before for the lights; and for the shades use a small grounding tool; prove it again; and so proceed to prove and touch till it is entirely to your mind.

Mr. Robert Lawrie, in the year 1776, proposed to the Society for the Encouragement of Arts, Manufactures, &c., a new method of printing mezzotinto prints in colors, for which he received a premium of thirty guineas. He says he was induced to attempt this method owing to the great expense attending the execution of good engravings, which had more than answered his most sanguine expectations. In this manner animals, plants, &c., for illustrating natural history, may be finished in their proper colors, very much like drawings, and greatly resembling nature. The plates will also admit of being repaired so as to furnish a large impression. The following is an explanation of his method:—

A copper-plate with an etched or engraved outline, dotted next the lights, and filled in with mezzotinto ground, is printed in colors after nature, or from a picture, by the following process: The plate being warmed, in the usual manner, the colors are applied by means of stump camel hair pencils to the different parts, as the subject suggests; it is then wiped with a coarse gauze canvas, any other being improper; after this it is wiped clean with the hand, and, being again warmed, is passed through the press. The colors are mixed with burnt linseed oil, and those generally used by painters are proper.

The invention of mezzotinto engraving is generally attributed to prince Rupert; but in Elmes's Life of Sir Christopher Wren, p. 108, it is given to that eminent architect. 'The mode of impressing pictures by light and shade on copper, commonly known by the name of engraving in mezzotinto, owes its improvement if not its origin to Wren.' The journals of the Royal Society for October 1, 1662, record that Dr. Wren presented some cuts done by himself in a new way, whereby he could almost as soon do a subject on a plate of brass or copper as another could draw it with a crayon on paper. On this subject the editor of Parentalia speaks with decision, that 'he was the first inventor of the art of graving in mezzotinto; which was afterwards prosecuted and improved by his royal highness prince Rupert, in a manner somewhat different, upon the suggestion, as it is said, of the learned John Evelyn, Esq.'

Aquatinta Engraving.—Aquatinta is a method of producing prints very much resembling drawings in Indian ink. The principle of the process consists in corroding the copper with aquafortis in such a manner that an impression from it has the appearance of a tint laid on the paper. This is effected by covering the copper with a powder, or some substance which takes a granulated form, so as to prevent the aquafortis from acting where the particles adhere, and by this means cause it to corrode the copper partially and in the interstices only. When these particles are extremely minute, and near to each other, the impression from the plate appears to the naked eye exactly like a wash of Indian ink; but when they are larger the granulation is more distinct: and, as this may be varied at pleasure, it is capable of being adapted with success to a variety of purposes and subjects.

This style of Engraving was invented by a French artist of the name of St. Non, who flourished about 1662, and communicated it to Jean Baptiste le Prince, a painter and etcher who was born at Paris in 1733, and died in 1781, who engraved many plates in this way. It was introduced into England and greatly improved by Paul Sandby. It is not much used at present.

Wood Engraving.—The art of engraving on wood is not only of very ancient date, but is a legitimate, beautiful, and artist-like mode of operation, for the production of prints, particularly for books. The first engravers on wood whose names have reached our times are William Pluydenwurff and Michael Wolgemuth, who engraved the cuts of the Nuremburg Chronicle which was published in folio in 1493, which are marked with all the stiffness and inaccuracy which characterise the works of the German artists of that time.

Albert Durer, as we have intimated, also practised the art of wood engraving with great success, which began now to assume a higher character; and, as far as regards the executive part, he brought it to a perfection which has hardly been equalled by any succeeding artist.

Bewick of Newcastle, Harvey his pupil, the Thompsons (brothers), Branston, and other living artists, have carried this art to the highest perfection.

Engraving on Steel is performed in nearly a similar way to engraving on copper. For etching on steel, the plate or block is bedded on glaziers' putty, and etched with a needle through a ground of Brunswick black in the common way. Messrs. Perkins and Heath have carried the art of engraving on plates of softened steel, afterwards hardened by a scientific process, to a great degree of perfection.

Engraving on Stone is a recent invention now in great vogue. It is cheap, and, when well performed, produces impressions of great beauty in imitation of chalk, mezzotinto pen and ink, and even of etching. See Lithography.

Engraving, or Etching, on Glass is performed by laying on a ground consisting of a thin coat of bees' wax, and drawing the design therein with an etching needle. It is then to be covered with sulphuric acid, sprinkled over with powdered fluor spar or fluoric acid. It must be taken off after four or five hours, and cleaned with oil of turpentine.

Engraving on Precious Stones is the representing of figures, or devices in relievo or indented, on divers kinds of hard polished stones. The ancients excelled in this art; there being divers antique agates, cornelians, and onyxes, which surpass any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioscorides under the first emperors of Rome, are the most eminent engravers we read of: the former was so esteemed by Alexander, that he forbad any body else to engrave his head: and the head of Augustus, engraven by the latter, was deemed so beautiful, that the succeeding emperors chose it for their seal. All the polite arts having been buried under the ruins of the Roman empire, the art of engraving on stones met with the same fate. It was retrieved in Italy at the beginning of the fifteenth century, when one John of Florence, and after him Dominic of Milan, produced engravings of this kind little inferior to those of the ancients. From this time such sculptures became common in Europe, and particularly in Germany, but they were mostly inferior productions. In this branch of engraving, the diamond is now generally used to cut the softer stones, as rubies, cornelian, &c. This being the hardest of all, however, can only be cut by its own substance. The operation of cutting is commenced by imbedding the diamond in strong cement, fixed at the end of a stout spindle-shaped stick about a foot long, with that portion only projecting which is required to be removed. Another diamond is employed to cut with, fixed as the former, with one of the solid angles projecting. The greatest care is taken of the valuable dust and fragments, a box being placed underneath with two upright iron pegs fixed on the sides, for the workman to support the sticks against, while, with a short repeated stroke, he wears away the stone to its required form. This being done, the cement is softened by heat, and the position of the diamond is changed, so as to bring a fresh part under the operation of the tool. The next object is now to polish the surface. The polishing mill is an extremely simple machine, consisting of a circular horizontal plate of cast iron, about fourteen inches in diameter, put into very rapid motion by a large wheel turned by an assistant. In a copper cup, filled with solder, the diamond is now imbedded; and the stem of the cup being fixed in a pair of screw tongs, the instrument is placed on the skive (polishing wheel), which charged with olive-oil and diamond dust, and whirling swiftly round polishes the face. The diamond is then ready for engraving, which can be done only by pieces of the same stone. Rubies, sapphires, and topazes, are cut and formed the same way on a copper wheel, and polished with tripoli diluted in water. As to agates, amethysts, emeralds, hyacinths, granites, rubies, and others of the softer stones, they are cut on a leaden wheel, moistened with emery water, and polished with tripoli on a pewter wheel. Lapis lazuli, opal, &c., are polished on a wooden wheel. To fashion and engrave vases of agate, crystal, lapis lazuli, or the like, a kind of lathe, like that used by pewterers, is used to hold the vessels, which are to be wrought with proper tools: that of the engraver generally holds the tools, which are turned by a wheel; and the vessel is held to them to be cut and engraved, either in relievo or otherwise; the tools being moistened from time to time with diamond dust and oil, or at least emery and water. To engrave figures or devices on any of these stones, when polished, such as medals, seals, &c., they use a little iron wheel, the ends of whose axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought closer, or set further apart, at pleasure; at one end of the axis are fitted the proper tools, which are made fast with a screw, and the stone is presented to them by the hand to be worn or cut to their required form.

Some Account of the Art, and of the Best Engravers.—The art of engraving in this country, like the practice in every other country, commenced and increased with civilisation and knowledge. Under Alfred the Great the art met with great encouragement, and remains of the art, as practised in his days, are still in existence. There is still preserved in the Museum at Oxford, a valuable jewel of this period, representing St. Cuthbert, the back of which is ornamented with foliage very skilfully engraved.

The principal engravers in the line manner, taken chronologically, are Martin Schoengauer, or Schoen, born at Colmar about 1455, and died there in 1499. His principal works are religious subjects from his own designs; Tommaso or Mazo Finiguerra, born at Florence in 1418, and died there in 1500; Israhel Von Mecheln or Mecken, born at Meckenen on the Meuse about the year 1450, and died 1523; Bacio Baldini and Sandro Boticello, called Filipepi, painter and engraver, born at Florence in 1437, died in 1515. To these two artists are attributed the first certain engravings after the Italian masters. In the cabinet of M. Paignon Dijonval at Paris, were nine fine prints by the latter. They are in the style of Andrea Mantegna; Michel Wohlgemuth died in 1519; Albert Durer, or Albrecht

Thurer, born at Nuremburg in 1471, died in 1528; the number of line engravings by this great artist amount to nearly a hundred, and are among the choicest specimens of the art; Albert Altdorfer, born at Altdorfer in Bavaria, about the year 1488, died at Ratisbon in 1538. His engravings are mostly after his own pictures; Andrea Mantegna, painter and line engraver, born at Padua in 1431, died September 15th, 1517; Marc Ant. Raymondi, about 1527, who engraved after Michel Angiolo, Raffaelle, Mazzuoli, Raibolini, and other eminent Italian masters; Agostino Veneziano, surnamed de Musis, about 1620, who engraved after Michel Angiolo, Raffaelle, all of which are dated. He was reckoned one of the first engravers in France, and inscribed his works A. Venetien; Nicolas Belin da Modena, and Giov. Ghisi Montovanto, who flourished about 1530; Luc Damesz, died in 1533; Giov. Giac. Caraglio and Marco Da Ravenna, about 1540; Giul. Bonasone, born at Bologna in 1498, died at Rome in 1564. He engraved many excellent plates after Michel Angiolo, particularly the last judgment, Pontormo, Raffaelle, Giulio Romano, Caravaggio, Mazzuoli, and Titian. Eneas Vicus, George Vens, Henrid Aldegraf, and Jean Sebast. Bœhm, about 1550; Adrian, Charles, William, and John Collært; Adrian the father was born at Antwerp in 1520, and designed and engraved many excellent plates after his own designs, as well as from the works of De Vos, Stradan, Rubens, Wattelet; Adam and George Ghisi, the latter born at Mantua in 1516; Lambert Sutermann, Fagivoli Franco, and Virgilius Solis, about 1560; Corneille Cost and Martin Rota, about 1569, the latter, born at Sevenigo in Dalmatia, engraved the Last Judgment after Michel Angiolo, in 1569, and other excellent performances; Giov. B. Cavalaris, about 1574, engraved the Adoration of the Shepherds after Bronzino, in 1565; a large plate of the Miracle of the Loaves, after Raffaelle, and other fine works; Steph. de Laurie, born at Orleans in 1510, and died at Strasburg in 1590. He engraved numerous fine plates; Jerome Bang, Paul Flynt, and Ger. Jode, about 1596; Conrad Jode and Jean Sadeler, who engraved many plates after Albert Durer, Heintz, de Vos, Spranger, &c., died in 1600; François Aspruck, about 1601; Agost. Caracci, whose numerous prints embellish the finest collection, was born at Bologna in 1558, and died in 1602; Jean Saenredam, born at Leyden in 1570, and died in 1607, engraved many fine plates after Caravaggio, Baroccio, Van Mander, Cornelius Bloemart, &c.; Nicolas De Bruyn, about 1610; Philippe Galle died in 1612; Daniel Kellerthaler about 1613; Cherubino Borghesiano Alberti, born in 1552, died in 1615, was a fine engraver and painter of the Roman school, who engraved many works after his own designs; nine of Michel Angiolo's pictures in the Capella Sistina; St. Jerome in the Desert, after the same great master; many after Raffaelle, also after Baroccio, Vanni, and other masters of the Italian school; Henri Goltzius, a celebrated line engraver, painter, and engraver on wood, born at Mulbrecht in 1588, died at Haerlem in 1617; he engraved a numerous collection after his own designs, the works of Raffaelle, Palma, Stradan, Spranger, and a great number of portraits of illustrious characters; Theodore Galle about 1620; Ambroise Bonvicino about 1622; François Villamena, born at Assisi in 1566, died at Rome in 1626; engraved many fine plates after his own designs, after Raffaelle, Baroccio, Fensoni, Lanfranc, Albano, Muziano, Veronese, and other eminent Italian masters; Henri de Goudt, born at Utrecht in 1585, died in 1630; he was a painter as well, and engraved his own designs, some from Elsheimer, &c.; Pierre Lastman, a painter of the Dutch school, born at Haerlem in 1562, and engraved several plates after Rembrandt, was the first who attempted, in 1626, the union of color to his prints, but with very little success; Robert Van Voerst about 1628, who, among other portraits, engraved one of Sir Kenelm Digby, for Overton the publisher; Giles Sadeler about 1629; an engraver of several plates after Albert Durer, Heintz, De Vos, Spranger, and other masters of the Flemish school; Crisp. de Paas, Schelte à Bolswert, Paul Pontius, known by the number and excellence of his works; Lucas Vorstermann, and Pierre de Ballin, about 1630; Jacques Matham, died in 1631; Pierre Jade, died in 1634; Luc. Kilian, died in 1637; Abraham Blœmars, born at Gorcum in 1567, died in 1647; John Payne, who died in 1648, is accounted the first Englishman who engraved in the line manner; he executed several portraits after Mytens, and other Flemish portrait painters; Giuseppe Zarlati, Jean Frédéric Greuther, who distinguished himself by engraving after the Florentine masters; Girol Rossi, Conrad Marinus, Jacques Neefs, Pierre Nolpe, Henri Snyers, who engraved much after Rubens; Conrad de Dalen, Conrad Caukerken, Pierre Clouet, and Pierre Jode, about 1650; Fr. Sneyders, died in 1657; Giuseppi Battista Gallestruzzi, a painter and engraver, born at Florence 1618; Jacq. Bellange, Pierre de Bleek, and Pierre Lombard, about 1660; Conrad Meyssens, about 1662; Théodore Matham, about 1663; Michel L'Asne, died in 1667; John Umbach and Michel Natalis, about 1670; Et. Baudet, who engraved many of the pictures of the Caracci, Albano, Poussin, Mignard, Bourdon, &c., flourished about 1664; Nic. Pithau died in 1671; Jean L'Enfant died in 1678; Charles Audran died in 1671; Robert Nanteuil died in 1678; Reg. Zeemann, Daniel Danckerts, J. Munichuysen, Elias Hainzelmann, and Anton. Blooterling, about 1680; Fr. Spierre, died in 1681; Guillaume Chateau died in 1683; Conrad Blœmart, about 1686; Guillaume Rousselet died in 1686; Cl. Melan died in 1688; Corn. de Visscher about 1690; Philippe Kilian died in 1696; Conrad Meyer died in 1698; Antoine Masson died in 1700; Gérard Audran, a most able artist and celebrated engraver, died in 1703; Gérard Edelinck, born at Antwerp in 1627, died at Paris in 1707; Antoine Trouveau about 1707; Conrad Vermeulen about 1707, Jean Baptiste Nollin about 1710; Louis Audran died in 1712; Jean Jacques Thurneiser died in 1718; Jean Ulric Kruns died in 1719, Philippe Thomassin about 1720; Michel Dossier about 1720; Etienne Picart, Ben Audran, died in 1721; Jean Henri Tischbein the elder, and Jean Louis Aberli, about 1722; Et. Desrochers about 1723; Arn. Westerhout died in

1725; Louis Simoneau died in 1727; Charles Simoneau and Jean Bapt. Poilly, died in 1728; Franç. Chereau, Martin Bernigeroth, and Bernard Picart, 1735; Jean Henri Stærklin died in 1736, who was peculiarly celebrated for engraving in miniature; his son, Jean Rodolphe, died in 1756, who followed his father to a still higher degree of perfection; Jean Gœrne died in 1738; Louis Desplaces died in 1739; Henri Simon Thomassin about 1741; Jacques Christophe Le Blond, died in 1741; Charles Dupins died in 1742; Robert Audenaert died in 1743; Giovanni Canossa died in 1747; Jean Guillaume Wolfgang died in 1748; Nicolas Henri Tardieu died in 1749; Pierre Drevet, the father and son, who both died in 1749; Jean Admiral, Jacques Aliamet, Laurent Cars, Et. Fessard, Jean Jacques Flipart, Th. Major, and Jean Ouvrier, about 1750; Jacq. André Friederick died in 1751; Jacques Frey died in 1752; Gaspard Duchange died in 1754; Georges Martin Preissler died in 1754; Nicholas de Larmessin, Bart. Crivellari, about 1755; Jean Audran died 1756; Philippe André Kilian died in 1759; J. Ph. Le Bas died in 1760; Jean Michel Liotard, and Jean Adam Schweickart, about 1760; Jérémie Jacques Sedelmayer died in 1761; Louis Serugue died in 1762; Jean Daulle died in 1763; Nicolas Beauvais died in 1763; Jean Jacques Balechou died in 1764; Antoine Faldoni died in 1765, Conrad Ploos van Amstel, born at Amsterdam in 1732, and was the inventor of the art of imitation of all sorts of drawings, colored or plain, to a great perfection. He engraved many imitations of the drawings of Wouvermans, Sachtleven, Van Dyck, Ostade, Mieris, Goltzius, Van Goyen, Brauwer, &c.; Gustave André Wolfgang, Jérôme Sperling, and Cl. Drevit, about 1766; Jean M. Bernigeroth, Marc Pitteri, and Jean Elie Riedinger, born at Ulm, died at Augsburg in 1767; a very eminent painter and engraver of animals and landscapes; Chrétien Frédéric Boethius, about 1764; Lor. Zuchi, about 1768; Jean Ch. François died in 1769; Jean El. Nilson, about 1769; Jacques Houbraiken, born at Dortdrecht in 1698, died in 1780; one of the finest engravers of portraits that ever lived; Jean Savant in 1770; François Basan, A. B. Barbaza, Jean Barry, Francesco Bartolozzi, born at Florence in 1730, died in London, 1807, one of the first engravers who practised the art of stipple or chalk engraving with any success. His works are very numerous, and are distinguished by delicacy and taste rather than force.

Among other eminent artists who practised this art, are: Jonathan Spilsbury, who engraved several of Angelica Kauffmann's works; W. Ryland, Rob. Menageot, G. F. Schmidt, Just. Preissler, Dan. Berger, C. Feller, P. W. Tomkins, Bichard, J. R. Smith, W. Dickinson, the two Facius's, J. Parker, Caroline Watson, H. Kingsbury, R. Macuard, T. Burke, G. Ward, G. P. Carey, Saillier, G. Sharp, V. M. Picot, Bettilini, P. Simon, Howard, G. Wilkinson, N. Pollard, C. Tomkins, Madame Prestel, J. M. Delatre, G. Graham, H. Sinzenich, Schiavonetti, &c. J. F. Bause, Jean Beauvarlet, Beavit, Salv. Carmona, G. Catini, G. B. Cecchini, Chevillet, Clemens, R. Cooper, Dom. Cunego, Nic. de Launay, William Ellis, Et. Figuel, Fab. Gautier, Dagoty, Pierre de Geust, Jacques Gilberg, Jean Hall, Antoine Hemery, Martin, Jan. Massin, Arch. Macduff, Massard, Chr. de Mechelen, P. E. Moitte, J. G. Müller, Et. Mulinari, J. Mart Preissler, Reinier, André Rossi, F. Selma, Jacq. Schmutzer, Rob. Strange, J. K. Sherwin, Jacq. Nicolas Tardieu, Porporati, Sim. Fres. Ravenet, Giov. Volpato, Rosaspina, Henri Vinkeles, Josué Wagner, Jean Georges Wille, William Woollet, Raffaelle Morghen, Pierre Ducros, Pierre Paul Montagniti, several members of the family of Haid, Jean Etienna, and Jean Michel Liotard, Unger, the father and son; Daniel Chodoweicki, the two Brands, the two Crusius's, Jean Guillaume Meil, Salomon Gessner, three Hackerts, Christian Gotslieb Geyser, Carle and Henri Guttenberg, Angelica Kauffmann, Stoelzel, Clement Kohl, Adam Bartsch, Schlotterbeck, Jean Henri Lips, Schubert, Schnorr, Boettcher, Durmer, Pfeiffer, Wrenk, Pichler, Geiger, &c. &c.

Among eminent English engravers are Robert Walker, born in Somersetshire in 1572, who engraved in aquafortis and mezzotinto; William Faithorne, born in London in 1620, and died in 1691, an excellent engraver of portraits; Robert White, born in 1645, died in 1704, portraits; J. Beckett, born in Kent in 1653, landscape, portrait and history; John Smith, the celebrated mezzotinto engraver, born in London in 1654, and died in the same city in 1722, of whose numerous and excellent works the cabinet of M. Paignon Dijonval at Paris alone contained nearly 1300; John Faber, born 1684, died 1756; also an eminent engraver in mezzotinto; William Hogarth, born in London in 1698, died in 1764, line engraver of his own inimitable works; Arthur Pond, engraver in aquafortis, born in 1700, died about 1758; Thomas Worlidge, celebrated for the delicacy and effect of his etchings, in the manner of Rembrandt, born at Peterborough in 1700, died at Hammersmith in 1766; Francis Hayman, better known as a painter; James Mac Ardell, mezzotinto, born in Ireland about 1720, died in London in 1765; Thomas Smith of Chichester, and his brothers John and George, landscapes; they were also painters. Captain William Bailly, aquafortis; Richard Houston, born in 1728, died in 1775, mezzotinto; John Greenwood, born at Boston about 1730, died about 1770, chalk and mezzotinto; William Wynn Ryland, born at London in 1732, died there in 1783, line and chalk; William Woollett, born at Maidstone 1735, died in London 1785; one of the most eminent line engravers that ever lived; Richard Brookshaw, born 1736, and practised much in France, where he engraved, in mezzotinto, Louis XVI. as dauphin, and as king with Maria Antoinette in 1775, and other French portraits; John Dixon, born about 1740, mezzotinto; John Hall, born about 1740, line engraving; John Raphael Smith, born in London 1740, very eminent in mezzotinto, and a good portrait painter in crayons; John Keyse Sherwin, born about 1746, chalk; Paul Sandby, R. A. a landscape painter, and very eminent in aquafortis and aquatinta; Robert Pollard died in 1748, aquatinta; John Boydell, born in 1719

and died an alderman of London in 1804, line; Josiah Boydell, his nephew, also an alderman of London, line; William Dickenson, born about 1750, mezzotinto and chalk; James Gilray, line, and peculiarly celebrated as the most eminent caricaturist of his day; James Fittler, born in London in 1753, eminent as a line engraver; William Ward, born about 1750, mezzotinto; J. Plimmer, who practised about 1760, aquafortis; Thomas Rowlet, aquafortis, about 1760; Robert Dodd, aquafortis and aquatinta, about 1770; Robert Thew, aquafortis and chalk, about 1786. The names of Vertue, Strange, Woollett, Byrne, Middiman, Milton, Sharpe, Lowry, and other eminent engravers of the English school, are known and honored wherever the arts are cultivated or understood.

Among the best engravers on wood, we must particularly mention Pierre Schæffer or Schoifer, whose colored figures in his celebrated Psalter (fol. 1457) prove that this mode of engraving, the invention of which is commonly attributed to Hugo Da Capri, had its rise in Germany. It is very probable that Martin Schœn, Michel Wolgemuth, and Guillaume Plydenwurfe engraved on wood about the middle, and at the end of the fifteenth century. The first artist in this line who can be mentioned with certainty is Jean Schnitzer, who wrought about 1480. Phillery, who lived near the end of the fifteenth century, is the first engraver on wood who practised in the Netherlands. Among other eminent wood engravers are Ad. Gampertin, about 1490; Rigm. Philesius, about 1508; Math. Grunwald died in 1510; Hugo Da Carpi, about 1510; Albert Altdorfer, about 1511; Agostino Veneziano de Musis, about 1514; Jean Balding in 1516; Jean Burgmayer died in 1517; Albert Durer died in 1528, of whose works the Baron de Heinechen has given a complete catalogue; Albert Glockenthon in 1510; Jean Guldenmund about 1526; Antoine Da Trento in 1530; Balthazar Peruzzi died in 1536; Henri Vogtherr died in 1537; Jean Springinklee died in 1540; Jean Brosshammer in 1542; Rodolphe Speckle in 1543; Jean Kulenback died in 1545; Daniel Beccafumi died in 1549; George Pens died in 1550; Jean Schæuflin died in 1550; Pierre Gatin, about 1550; Erhardt Schœn, about 1550; Jean Sébastien Bœhm, about 1550; the brothers Hopfer; Henri Aldegraf, about 1551; Conrad Gesner, about 1550, who engraved natural history, marked his works with the word Fo; Lucas Van Leyden died in 1553; Jerome Resch died in 1556; Jean Bochsbergen, about 1560; Gietleughen De Courtray about 1550; Jacques Kerver about 1560; Virg. Solis died in 1562; Sigfried Feyerabendt, about 1569, of which name and family were many engravers; S. Vichem about 1570; Christophe Chrieger in 1572; Christophe Sichem in 1573; O. Goujeon, in 1575; Salomon Bernhard, in 1580; Dupont, in 1583; Itrenze, about 1585; Luc. Muller de Cranach, died in 1586; Jean Rogel, about 1588; Leon. Norsino, in 1590: Christophe Stimmer, in 1590; Marc Claseri, in 1590; Jost. Aman died in 15?1; Jacques Zuberlin, about 1595; Christophe Coriolan, in 1600; André Andriani, died in 1623; Gio. Georg. Nivolstelia, died in 1624; Barthélemi and Jean Baptiste Coriolan, about 1630; Christophe Jegher, 1637; Etienne Du Val, in 1650; Pierre le Sueur the elder, in 1698; the two Papillons, died in 1710, and 1724; Pierre le Sueur, jun. died in 1716; Gonzalez van Hayden, died in 1720; Kerkhal, about 1720; El. Porcelius died in 1722; Vincent le Sueur died in 1743; Jean Baptiste Jackson, about 1745; Giuseppe Maria Moretti died in 1746; Giovanni Battista Canossa died in 1747; Maurice Roger, about 1747; Pierre le Sueur died in 1750; Nicolas le Sueur died in 1764; Elis le Sueur in 1765; Antoine Marie Zanetti, who died in 1767, endeavoured to revive the peculiar manner of Hugo Da Carpi: Nicolas Caron, Jean Baptiste Papillon, the two M. M. Unger, Beugnet, Dugoure, &c.

The principal English engravers on wood are mentioned in the early part of this article.

Works on Engraving.—For treatises on this elegant and useful art, see Strutt's Dictionary of Engravers; Bryan's Dictionary of Painters and Engravers; Meadow's Lectures on Engraving, London, 8vo. 1811. Of the earlier writers are Felibien's Principes de l'Architecture et des autres Arts, qui y dépendent. Idée generale d'une Collection complète d'Estampes; Christ, Dictionnaire des Monogrammes; Papillon, Histoire de la Gravure en Bois.

In English, Sculptura; or, the History and Art of Chalcography and Engraving in Copper, by John Evelyn, Lond. 12mo. 1663, 8vo. 1755. The Art of Engraving and Etching, with the way of printing Copper-plates, by M. Faithorne, Lond. 1702. Sculptura historico-technico; or, the History and Art of Engraving, extracted from Baldinucci, Florent, Le Compte, Faithorne, the Abecadario Pittorico, and other authors, Lond. 4to. 1747, 1766, and 1770. An Essay upon Prints, containing Remarks upon the Principles of Picturesque Beauty, the different kinds of Prints, and the Characters of the most noted Masters, illustrated by Criticism upon particular Pieces: to which are added some Cautions that may be useful in collecting Prints, by Gilpin, Lond. 8vo. 1767, 1768, and 1781.

Among the Dutch the principal writer is Gerard Lairesse, who, in the thirteenth book of his Grand Livre des Peintres, has treated of the art of engraving with great ability.

Of German writers on engraving may be cited the seventh section of the second part of the work of Kœremon, entitled De la Nature et de l' Art. The twelfth section of the second part of the first volume of the work of M. Prangen, which is entitled Essai sur la Formation d'une Académie des Beaux Arts. The work called Sur l' Etude de la Gravure, par Louis Fronhofer, which is printed in the Mémoires de l' Académie de Bavière, Munich, 8vo. 1781.

Among the theoretical works on this art worth consulting must be numbered le Dictionnaire de Chiffres, et de Lettres ornées á l' usage de tous les Artistes, contenant les vingt-quatre Lettres de l' Alphabet, combinées de manière à y rencontrer tous les noms et surnoms entrelacés, par M. Pouget, Paris, 1766; Le Pastel en Gravure, inventé et exécuté par Louis Bonet, composé de huit épreuves qui indiquent les différens degrés,

Paris, 8vo. 1760; Nouvelle Manière de faire des Gravures de différentes Couleurs, à la manière du Dessin, par J. J. Bylaert.

On aquatinta, or prints in imitation of washed drawings, L'Art de Graver au Pinceau; nouvelle Méthode plus prompte qu'aucune de celles qui sont en usage, qu'on peut exécuter facilement sans avoir l' Habitude du Burin, ni de la Pointe, mise au jour par M. Stapart, 12mo. Paris, 1773. This work is translated into German by Harempeter, Nuremburg, 1780. Bosse has also given a section of his work to the same subject.

Upon the history of engraving the student may consult with profit, Comminciamento e Progresso dell' Arte d'intagliar in rame, da Filippo Baldinucci, Firenze, 4to. 1686; with the Supplements of Dom, Maria Manni, Firenze, 1761; Abrégé Historique de l'Origine et des Progrès de la Gravure, et des Estampes en Bois et en Tailledouce, par le Major Humbert, Berlin, 8vo. 1752; Histoire de la Gravure, jusqu'au temps d'Albert Durer, printed in the tenth volume of the Journal des Arts de M. De Muzz. Also a dissertation in the twenty-fifth volume of La Nouvelle Bibliothèque des Belles Lettres, sur l'Histoire de la Gravure en Allemagne, depuis son invention jusqu'a l'an 1500; Essai d'une Histoire de la Gravure, depuis sa première origine, suivi de celle des Progrès de cet Art, dans les Nouvelles des Arts et des Artistes, p. 276. See Arts, Mezzotinto, Monogram, Lithography, Schools, Prints, &c.

ENGRIEVE, *v. a.* From en and grieve. To pain; vex; afflict.

> The gnawing anguish, and sharp jealousy,
> Which his sad speech infixed in my breast,
> Rankled so sore, and festered inwardly,
> That my *engrieved* mind could find no rest.
> *Faerie Queene.*

Aches, and hurts, and cords, do *engrieve* either towards rain, or towards frost. *Bacon's Natural History.*

ENGROSS', *v. a.* } Fr. *engraisser.* From
ENGROSS'ER, *n. s.* } en and the Lat. *crassus.*
ENGROSS'MENT. } Thick; fat; large: hence to enlarge; increase; make thick; fatten: hence also to seize largely, or in the gross; to copy largely or very legibly; to buy up goods largely; occupy a market: an engrosser is he who purchases largely to resell at his own price: engrossment, exorbitant acquisition or appropriation; a full or final copy of a written instrument.

> But more happy he than wise,
> Of that sea's nature did him not avise;
> The waves thereof so slow and sluggish were,
> *Engrossed* with mud, which did them foul agriese,
> That every weighty thing they did upbear.
> *Faerie Queene.*

> Not sleeping, to *engross* his idle body;
> But praying, to enrich his watchful soul. *Shakspeare.*

> If thou *engrossest* all the griefs as thine,
> Thou robbest me of a moiety. *Id.*

> Here is the' indictment of the good lord Hastings,
> Which in a set hand fairly is *engrossed.* *Id.*

> Our thighs are pack't with wax, our mouths with honey.
> We bring it to the hive; and, like the bees,
> Are murdered for our pains! This bitter taste
> Yield his *engrossments* to the dying father. *Id.*

Though pillars, by channeling, be seemingly *engrossed* to our sight, yet they are truly weakened in themselves. *Wotton.*

Nothing more troubled Israel, than a fear lest the two brethren should cunningly *engross* the government to themselves. *Bp. Hall's Contemplations.*

A new sort of *engrossers*, or forestallers, having the feeding and supplying this numerous body of workmen in the woollen manufactures, out of their warehouses, set the price upon the poor landholder. *Locke.*

Those two great things that so *engross* the desires and designs of both the nobler and ignobler sort of mankind, are to be found in religion; namely, wisdom and pleasure. *South.*

> A dog, a parrot, or an ape,
> Or some worse brute in human shape,
> *Engross* the fancies of the fair. *Swift.*

Those held their immoderate *engrossments* of power and favour by no other tenure than presumption. *Id.*

> A clerk, foredoomed his father's soul to cross,
> Who pens a stanza when he should *engross.* *Pope.*

From the letters that passed between him and Pope, it might be inferred they, with Arbuthnot and Gay, had *engrossed* all the understanding and virtue of mankind. *Johnson. Life of Swift.*

The earl of Angus, in order to divert him from business, gave him an early taste for such pleasures as afterwards occupied and *engrossed* him more than became a king. *Robertson's History of Scotland.*

> War and the chase *engross* the savage whole;
> War followed for revenge, or to supplant
> The envied tenants of some happier spot. *Cowper.*

> You mourned for ruined man, and virtue lost,
> And seemed to feel of keen remorse the wound,
> Pondering on former days by guilt *engrossed*,
> Or in the giddy storm of dissipation tossed. *Beattie.*

ENGROSSING, in law, the writing a deed over fair and in proper legible characters. Among lawyers it more particularly means the copying of any writing fair upon parchment, or stamped paper.

Engrossing, in law, also denotes the getting into one's possession, or buying up, large quantities of corn, or other dead victuals, with intent to sell them again. This must of course be injurious to the public, by putting it in the power of one or two rich men to raise the price of provisions at their own discretion. Spreading rumors with intent to enhance the price of hops, saying in the hearing of hop planters, dealers, and others, that the stock of hops was nearly exhausted, and that there would be a scarcity of hops, &c., with intent to induce them not to bring their hops to market for sale for a long time, and thereby greatly to enhance the price.—Engrossing large quantities of hops, by buying from many persons, certain quantities with intent to resell the same for an unreasonable profit, and thereby to enhance the price.—Getting into hand large quantities, by contracting with various persons for the purchase, with intent to prevent the same being brought to market, and to resell at an unreasonable profit, &c.—Engrossing hops then growing, by forehand bargains, with like intent.—Buying all the growth of hops on certain lands, in certain parishes, by forehand bargains, with intent to sell at an unreasonable price, &c. Rex v. Waddington. 1 East's Rep. 143—169.—In which case it was ruled that to forestall any commodity which is

become a common victual and necessary of life, or used as an ingredient in the making or preservation of any victual, though not formerly used or considered as such, is an offence at common law. Indictment for engrossing a great quantity of fish, geese and ducks, held bad, without specifying the quantity of each. Rex v. Gilbert. 1 East Rep. 583. So the total engrossing of any other commodity, with intent to sell it at an unreasonable price, is an offence indictable and fineable at the common law. Cro. Car. 232. And the general penalty for this offence, as well as for FORESTALLING and REGRATING (which see), by the common law (for all the statutes concerning them were repealed by 12 Geo. III. c. 71.) is, as in other minute misdemeanors, discretionary fine and imprisonment. 1 Hawk. P. C. 235. Among the Romans these offences, and other mal-practices to raise the price of provisions, were punished by a pecuniary mulct. 'Pœna viginti aureorum statuitur adversus eum, qui contra annonam fecerit, societatemve coierit quo annona carior fiat.' Stat. 2 & 3, Edw. VI. c. 15. seems yet in force; prohibiting butchers, brewers, bakers, poulterers, cooks, and fruiterers, from conspiring not to sell victuals, but at certain prices, on penalty of £10 for the first offence, £20 for the second, £40 for the third, &c.; and if such conspiracy be made by any company, or body corporate, the corporation shall be dissolved. See MONOPOLY and CORN LAWS.

ENGUA'RD, *v. a.* From en and guard. To protect; to defend; to surround as guards. Not used.

> A hundred knights! yes, that on every dream
> He may *enguard* his dotage with their powers,
> And hold our lives at mercy.
>
> *Shakspeare. King Lear.*

ENHANCE', } Fr. *hausser*, *haut*, which,
ENHANCE'MENT, } according to Wachter, are the same with the Sax. hethe, height; and probably from Lat. *altus*, high. To raise up or advance literally or metaphorically; to aggravate: enhancement is either of value or of ill.

> And thou Cafarnaum art *enhaunsid* til to hevene thou schalt be drenchid till into helle.
>
> *Wiclif. Luk.* 10.

> Both of them high at once their hands *enhanced*,
> And both at once their huge blows down did sway.
>
> *Spenser.*

> Their yearly rents are not improved, the landlords making no less gain by fines than by *enhancement* of rents.
>
> *Bacon.*

> To believe or pretend that whatever our hearts incite is the will of God within us, is the principle of villainy that hath acted in the children of disobedience, *enhanced* and improved with circumstances of greater impudence than the most abominable heathens were guilty of.
>
> *Hammond.*

> What is it but the experience of want that *enhances* the value of plenty?
>
> *L'Estrange.*

> The desire of money is every where the same: its vent varies very little, but as its greater scarcity *enhances* its price, and increases the scramble.
>
> *Locke.*

> Jocular slanders have, from the slightness of the temptation, an *enhancement* of guilt.
>
> *Government of the Tongue.*

> The remembrance of the difficulties we now undergo, will contribute to *enhance* our pleasure.
>
> *Atterbury.*

> That gratitude and temperance in our use
> Of what he gives unsparing and profuse,
> Secure the favour, and *enhance* the joy,
> That thankless waste and wild abuse destroy.
>
> *Cowper.*

> Then Cupid, to *enhance* the prize,
> Gave all his little arts could reach:
> To dart Love's language from the eyes
> He taught—'twas all was left to teach.
>
> *Sheridan.*

ENHARMONIC, in music. The Greeks had three different species of music; the diatonic, the chromatic, and the enharmonic. This last was esteemed by much the most agreeable and powerful of the three; but the difficulty of its execution rendered its duration short, and later artists were upbraided for having sacrificed it to their indolence. It proceeded upon lesser intervals than either the diatonic or chromatic; and as the chromatic semitone is still less than the diatonic, the enharmonic intervals must have consisted of that semitone divided into parts more minute. In Rousseau's Musical Dictionary, article ENHARMONIQUE, the reader may see how that interval was found in the tetrachords of the ancients. It is not easy for modern ears, inured to intervals so widely different, to imagine how a piece of music, whose transitions were formed either chiefly or solely upon such minute divisions, could have such wonderful effects; yet the melody of speech, which rises or falls by intervals still more minute than the enharmonic, when properly modulated and applied with taste, has an astonishing power over the soul. Modern melody being built upon harmony, derived from the harmonics of a fundamental-base, we have no instruments with quarter-tones, or which can furnish a base to an enharmonic melody, if we had the power of framing and executing it with the voice or violin. We have, therefore, only two genera in our music, which two genera, the diatonic, consisting of five tones and two semi-tones in the octave, such as the key of C natural supplies upon keyed instruments; and the chromatic, consisting entirely of semi-tones, twelve in number, such as moving from any given note to its octave by semi-tones will furnish.

ENHARMONIC DIESIS, is an interval whose ratio is $\frac{128}{125} = 21\,\Sigma + 2\,\mathrm{m}$. See DIESIS.

ENHARMONIC DEGREE OF ARISTOXENUS, otherwise his diesis quadrantalis, was a quarter of the major tone, or $26\,\Sigma + \frac{1}{2}\,\mathrm{f} + 2\frac{1}{4}\,\mathrm{m}$.

ENHARMONIC DEGREE OF EUCLID, otherwise his diesis quadrantalis, was three-thirtieths of a minor fourth, or $25\frac{3}{5}\,\Sigma + \frac{1}{2}\,\mathrm{f} + 2\frac{1}{5}\,\mathrm{m}$.

ENHARMONIC DITONE OF EUCLID was twenty-four thirtieths of a minor fourth, or $204\frac{4}{5}\,\Sigma + 4\,\mathrm{f} + 17\frac{3}{5}\,\mathrm{m}$.

ENHARMONIC QUARTER OF A TONE, is the same with enharmonic diesis, above.

ENHYDRUS, in natural history, a genus of siderochita or crustated ferruginous bodies, formed in large and mostly empty cases, enclosing a small quantity of an aqueous fluid. Of this genus there are only two species: 1. The thick shelled enhydrus, with black, reddish-brown, and yellow crusts. 2. The thinner-

shelled kind, with yellowish-brown and purple crusts; neither of which ferments with aquafortis or gives fire with steel.

ENJEDIM (George), in biography, a Unitarian author, who flourished in the sixteenth century, in Hungary, whence he removed to Transylvania, and became a superintendent of the Unitarian churches. He died in the year 1597, and was regarded as one of the best writers in what is called the Socinian cause. His principal work was Explicatio Locorum Scripturæ Veteris et Novi Testamenti, ex quibus Dogma Trinitatis stabiliri solet, 4to. The first impression was burnt by the public authorities; but a new edition was afterwards published in the Netherlands. Moreri.

ENIF, in astronomy, a fixed star of the third magnitude, in Pegasus's mouth.

ENIG'MA, *n. s.*
ENIGMAT'ICAL, *adj.*
ENIGMAT'ICALLY, *adv.*
ENIG'MATIST, *n. s.*
} Fr. *enigme;* Span. Port. and Ital. *enigma;* Lat. *ænigma;* Gr. *αινιγμα,* from *αινιττομαι,* to speak darkly. A dark or obscure speech or saying; a riddle. The adjective and adverb follow this sense: an enigmatist is he who makes or proposes enigmas.

Your answer, sir, is *enigmatical. Shakspeare.*

Faith here is the assent to those things which come to us by hearing, and are so believed by adherence, or dark *enigmatical* knowledge, but hereafter are seen or known demonstratively. *Hammond.*

*Enigmatical* deliveries comprehend useful verities; but being mistaken by liberal expositors at first, they have been misunderstood by most since.
*Browne's Vulgar Errours.*

Whilst they affect *enigmatical* obscurity, they puzzle the readers of their divulged processes.
*Boyle.*

The dark *enigma* will allow
A meaning; which, if well I understand,
From sacrilege will free the god's command.
*Dryden.*

That I may deal more ingenuously with my reader than the above-mentioned *enigmatist* has done, I shall present him with a key to my riddle. *Addison.*

Athenæus gives instances of the *enigmatical* propositions in use at Athens, and of the forfeitures and rewards upon the solution or nonsolution.
*Broome's Notes on the Odyssey.*

Homer speaks *enigmatically,* and intends that these monsters are merely the creation of poetry. *Broome.*

A custom was amongst the ancients of proposing an *enigma* at festivals, and adjudging a reward to him that solved it. *Pope.*

This page of Providence quite new,
And now just opening to our view,
Employs our present thoughts and pains,
To guess and spell what it contains:
But day by day, and year by year,
Will make the dark *enigma* clear. *Cowper.*
Unlike the *enigmatic* line,
So difficult to spell,
Which shook Belshazzar at his wine,
The night his city fell. *Id.*

ENIGMA. In the article ÆNIGMA are inserted some of the most curious specimens of this species of composition. Junius defines an enigma to be an obscure parable, or allegory; and makes two kinds: the one greater, rendering the sentence more intricate and knotty, by a multitude of words; the other lesser, consisting of only one or two remote words, or allusions; as in Isaiah xi. i. where Jesus Christ is called נצר surculus, rod, or branch. The best Latin collection of verbal enigmas, is that of Giraldi, as republished by Reusner Leorinus, France, 1602.

ENIGMAS, PAINTED, are representations of the works of nature or art, concealed under human figures drawn from history or fable. Thus Jesus Christ, in the middle of the doctors, represents the Bible, &c. It is easier to find good subjects for enigmas in figures than in words, inasmuch as painting attracts the eyes, and excites the attention to discover the sense. The subjects of enigmas in painting are to be taken either from history or fable; the composition here is a kind of metamorphosis, wherein, e. g. human figures are changed into trees, and rivers into metals. This conversion, however, does not depend merely on caprice; there must be something of suitableness, and even erudition to authorise it. Thus the battle of Constantine against Maxentius may be taken for the subject of an enigma, to represent the game of chess: the sign which appeared in the heavens with the words, 'in hoc signo vinces,' may properly enough represent the secret of this game, which consists in saving the king. It is much easier, however, to turn mythology into enigmas, than history.

ENJOIN', *v. a.*
ENJOIN'MENT, *n. s.*
} Fr. *enjoindre;* Lat. *injungere.* To join (a command) to any person or thing; to lay a command upon; direct; order: enjoinment is direction; command.

To satisfy the good old man,
I would bend under any heavy weight
That he'll *enjoin* me to.
*Shakspeare. Much Ado about Nothing.*

Monks and philosophers, and such as do continually *enjoin* themselves. *Bacon's Natural History.*

If God *enjoined* ordinary fire, they had sinned to look for celestial; now he commanded only the fire which he sent. *Bishop Hall's Contemplations.*

I see God *enjoining* them to send; but *enjoining* it, upon their instance. *Id.*

Yearly *enjoined*, some say, to undergo
This annual humbling certain numbered days,
To dash their pride and joy for man seduced.
*Milton.*

Critical trial should be made by publick *enjoinment*, whereby determination might be settled beyond debate.
*Browne's Vulgar Errours.*

It endeavours to secure every man's interest, by *enjoining* that truth and fidelity be inviolably preserved.
*Tillotson.*

Slight were the tasks *enjoined* him by his lord,
To hold the stirrup or to bear the sword;
To tune his lute, or, if he willed it more,
On tomes of other times and tongues to pore.
*Byron.*

ENJOY', *v. a.* & *v. n.*
ENJOY'ER, *n. s.*
ENJOY'MENT.
} Fr. *jouir, enjouir;* Lat. *gaudere;* to be glad (the g being softened into j.). To feel with pleasure; to obtain the practice of; to please; gladden; taking the reciprocal pronoun: as a neuter verb, to live happily.

Creatures are made to *enjoy* themselves, as well as to serve us. *More.*

Edward the saint, in whom it pleased God, righteous and just, to let England see what a blessing sin and iniquity would not suffer it to *enjoy*. *Hooker.*

Pleasure is nothing but the intermission of pain, the *enjoying* of something I am in great trouble for till I have it. *Selden.*

An absurd way of *enjoying* ourselves at meals is, where the bottle is plied without being called for, where humour takes place of appetite, and the good company are too dull, or too merry, to know any *enjoyment* in their senses. *Fuller.*

He, who, to *enjoy*
Plato's elysium, leaped into the sea,
Cleombrotus. *Milton's Paradise Lost.*

Then I shall be no more!
And Adam, wedded to another Eve,
Shall live with her *enjoying*, I extinct. *Id.*

Health is the soul that animates all *enjoyments* of life; which fade, and are tasteless, if not dead without it. *Sir W. Temple.*

In our pursuit of the things of this world, we usually prevent *enjoyment*, by expectation; we anticipate our own happiness, and eat out the heart and sweetness of worldly pleasures, by delightful forethoughts of them. *Tillotson.*

His hopes and expectations are bigger than his *enjoyments*. *Id.*

The obligation any one is under, by virtue of such *enjoyment*, to submit to the government, begins and ends with the *enjoyment*; so that whenever the owner, who has given nothing but such a tacit consent to the government, will, by donation, sale, or otherwise, quit the said possession, he is at liberty to go and incorporate himself into any other commonwealth. *Locke.*

When a man shall, with a sober, sedate, diabolical rancour, look upon and *enjoy* himself in the sight of his neighbour's sin and shame, can he plead the instigation of any appetite in nature? *South.*

Covetousness, by a greediness of getting more, deprives itself of the true end of getting: it loses the *enjoyment* of what it had got. *Sprat.*

A contented mind is the greatest blessing a man can *enjoy* in this world; and if in the present life his happiness arises from the subduing of his desires, it will arise in the next from the gratification of them. *Addison.*

I could *enjoy* the pangs of death,
And smile in agony. *Id. Cato.*

He shall never truly *enjoy* his present hour, who never thinks on his last. *Young.*

Every man is rich or poor, according to the proportion between his desires and *enjoyments*. Of riches, as of every thing else, the hope is more than the *enjoyment*. *Johnson.*

It cannot reasonably be doubted, but a little miss, dressed in a new gown for a dancing-school ball, receives as complete *enjoyment* as the greatest orator, who triumphs in the splendour of his eloquence, while he governs the passions and resolutions of a numerous assembly. *Hume.*

It is the dignity of our natures, that we are capable of knowing and *enjoying* him that made us. *Mason.*

Me fruitful scenes and prospects waste
Alike admonish not to roam;
These tell me of *enjoyments* past,
And those of sorrows yet to come. *Cowper.*

ENKIND'LE, *v. a.* From en and KINDLE, which see. To fire; inflame; rouse to passion; incite.

Do you not hope your children shall be kings,
When those who gave the Thane of Cawdor to me,
Promised no less to them?
——— That trusted home,
Might yet *enkindle* you unto the crown. *Shakspeare.*

Edmund, *enkindle* all the sparks of nature,
To quit this horrid act. *Id. King Lear.*

ENLARGE', *v. a.* & *v. n.* }
ENLARGE'MENT, *n. s.* }
ENLARGE'R. }
Fr. *enlargir*; from en and large. To make greater; increase; exaggerate; amplify; diffuse; hence to deliver from limits or bondage.

If thou holdest thy peace at this time, then shall there *enlargement* and deliverance arise to the Jews from another place. *Esther* iv. 14.

O ye Corinthians, our mouth is open unto you, our heart is *enlarged*. 2 *Cor.* vi. 11.

It hath grown from no other root than only a desire to *enlarge* the necessary use of the word of God, which desire hath begotten an errour, *enlarging* it farther than soundness of truth will bear. *Hooker.*

Though she appear honest to me, yet at other places she *enlargeth* her mirth so far, that there is shrewd construction made of her. *Shakspeare.*

Lieutenant,
At our *enlargement* what are thy due fees? *Id.*
*Enlarge* the man committed yesterday,
That railed against our person. *Id. Hen. V.*

The caliphs obtained a mighty empire, which was in a fair way to have *enlarged*, until they fell out among themselves. *Raleigh.*

The king afterwards *enlarged* the constant obedience of the city with *enlargement* both of liberties and of revenues. *Hayward.*

It is a miserable thing, when governours humour the people in their sins; and instead of making up the breach *enlarge* it. *Bp. Hall's Contemplations.*

They appointed the chancellor of the exchequer to *enlarge* upon any of those particulars. *Clarendon.*

He concluded with an *enlargement* upon the vices and corruptions which were got into the army. *Id.*

This is that science which would truly *enlarge* men's minds, were it studied. *Locke.*

Could the mind, as in number, come to so small a part of extension or duration as excluded divisibility, that would be the indivisible unit, or idea; by repetition of which it would make its more *enlarged* ideas of extension and duration. *Id.*

'Tis the property of all true knowledge, especially spiritual, to *enlarge* the soul by filling it; to *enlarge* it without swelling it; to make it more capable, and more earnest to know, the more it knows. *Sprat.*

This is a theme so unpleasant, I delight not to *enlarge* on it; rather wish the memory of it were extinct. *Decay of Piety.*

There never were any islands, or other considerable parcels of land, amassed or heaped up; nor any *enlargement*, or addition of earth, made to the continent by the mud that is carried down into the sea by rivers. *Woodward.*

The commons in Rome generally pursued the *enlargement* of their power by more set quarrels of one entire assembly against another. *Swift.*

The wall, in lustre and effect like glass,
Which o'er each object casting various dyes,
*Enlarges* some, and others multiplies. *Pope.*
And all who told it, added something new;
And all who heard it made *enlargements* too. *Id.*

This is not solely owing to the *enlargement* of the iris of the eye, since that is performed in an instant, but to this law of sensation, that when a less stimulus is applied (within certain bounds) the sensibility increases. *Darwin.*

Had he never left this spot, his notions might have remained the same as at first; and had he travelled but a little way from it, they would not perhaps have received any material *enlargement*. *Beattie.*

It was such pleasure to behold him, such
*Enlargement* of existence to partake
Nature with him, to thrill beneath his touch,
To watch him slumbering, and to see him wake.
*Byron.*

ENLARGE, in the manege, is used for making a horse go large, that is making him embrace more ground than he before covered. This is done when a horse works upon a round, or upon volts, and approaches too near the centre, so that it is desired he should gain more ground, or take a greater compass. To enlarge your horse, you should prick him with both heels, or aid him with the calves of your legs, and bear your hand outwards. If your horse narrows, he is enlarged with pricking him with the inner heel, and sustaining him with the outer leg, in order to press him forwards, and make his shoulders go. Upon such occasions the riding-masters cry only large, large.

ENLIGHT', *v. a.*, ENLIGHTEN, *v. a.*, ENLIGHTEN'ER, *n. s.* From en and LIGHT, which see. Sax. enlihtan. To illuminate; supply with light: hence to quicken or improve vision; and metaphorically to instruct; afford knowledge to; cheer; gladden.

His eyes were *enlightened.* *Sam.*

God will *enlighten* my darkness. *Psalms.*

Those who were once *enlightened.* *Hebrews.*

As the sun shineth to the whole world, so there is no faith but this one published, the brightness whereof must *enlighten* all that come to the knowledge of the truth. *Hooker.*

How easy is it for him that made the eye of man and beast, to dim or *enlighten* it at his pleasure.
*Bp. Hall's Contemplations.*

O, sent from heaven,
*Enlightener* of my darkness! gracious things
Thou hast revealed. *Milton's Paradise Lost.*

The more a body is near to the eyes, and the more directly it is opposed to them, the more it is *enlightened*; because the light languishes and lessens, the farther it removes from its proper source.
*Dryden's Dufresnoy.*

Love never fails to master what he finds;
The fool *enlightens*, and the wise he blinds. *Id.*

The head truly *enlightened* will presently have a wonderful influence in purifying the heart. *Sprat.*

This doctrine is so agreeable to reason, that we meet with it in the writings of the *enlightened* heathens. *Spectator.*

'Tis he who *enlightens* our understanding, corrects our wills, and enables us to subdue our affections to the law of God. *Rogers.*

Wit from the first has shone on ages past,
*Enlights* the present, and shall warm the last.
*Pope.*

Sir, I confess, I feel a sentiment of deep indignation, when I hear (I take it from report) that this scrap of nonsense was uttered to one of the most enlightened of the human race. *Sheridan.*

ENLI'NK, *v. a.* From link. To chain to; to connect.

*Enlinkt* to waste and desolation.
*Shakspeare. Henry V.*

ENLI'VEN, *v. a.*, ENLI'VENER, *n. s.* A compound of LIVE, which see We had an older word, enlive, of the same sense. To give life or spirit to; to quicken; gladden. An enlivener, is that which animates or invigorates.

But fire, tho' *enlivener* of the general frame,
Is one, its operation still the same:
Its principle is in itself; while ours
Works, as confederates war, with mingled powers
*Dryden.*

These great orbs thus radically bright,
Primitive founts and origins of light,
*Enliven* worlds denied to human sight. *Prior.*

In a glass-house the workmen often fling in a small quantity of fresh coals, which seems to disturb the fire, but very much *enlivens* it. *Swift.*

It is content of heart
Gives Nature power to please;
The mind that feels no smart
*Enlivens* all it sees. *Cowper.*

Improving thus fast, perhaps, by degrees,
We may see rolls and butter spread under the trees,
With a small pretty band in each seat of the walk,
To play little tunes and *enliven* our talk. *Sheridan.*

The rose was yet upon her cheek,
But mellowed with a tenderer streak:
Where was the play of her soft lips fled?
Gone was the smile that *enlivened* their red.
*Byron. Siege of Corinth.*

ENLIST'. From list. Fr. *liste*; Ital. *lista*; Sax. lisan. To enter on the roll or list of some particular calling or service.

Besides this body of regular troops, there are stragglers, who, without being duly *enlisted* and enrolled, do infinite mischief to those who are so unlucky as to fall into their hands. *Addison.*

A story in which native humour reigns
Is often useful, always entertains.
A graver fact, *enlisted* on your side,
May furnish illustration, well applied.
*Cowper.*

ENLU'MINE, *v. n.* See ILLUMINE. To illuminate; to enlighten. Not in use.

For having yet, in his deducted spright,
Some sparks remaining of that heavenly fire,
He is *enlumined* with that goodly light,
Unto like goodly semblance to aspire. *Spenser.*

EN'MITY, *n. s.* Fr. *inimitié.* *In*, not, and amity. See ENEMY. State of opposition or unfriendliness; aversion; malice; malevolence.

Know ye not that the friendship of the world is *enmity* with God? *James* iv. 4.

They shall within this hour,
On a dissention of a doit break out
In bitterest *enmity.* *Shakspeare. Coriolanus.*

Between thee and the woman I will put
*Enmity*; and between thine and her seed:
Her seed shall bruise thy head, thou bruise his heel.
*Milton.*

How far those controversies, and appearing *enmities* of those glorious creatures, may be carried, is not my business to shew or determine. *Dryden.*

And here we have the plain difference between the state of nature and the state of war, which, however some men have confounded, are as far distant as a state of peace, good will, mutual assistance and preservation, and a state of *enmity*, malice, violence, and mutual destruction, are one from another. *Locke.*

You must firmly be convinced, that every sin you commit sets you at *enmity* with heaven, and will, if not forsaken, render you incapable of it. *Wake.*

He who performs his duty in a station of great power, must needs incur the utter *enmity* of many, and the high displeasure of more. *Atterbury.*

He had too much merit not to excite some jealousy; too much innocence to provoke any *enmity.* *Burke.*

ENMA'RBLE, *v. a.* From en and marble. To turn to marble; to harden. Obsolete.

> Their dying to delay,
> Thou dost *enmarble* the proud heart of her,
> Whose love before their life they do prefer.
> *Spenser.*

ENME'SH, *v. a.* From en and mesh. To net; to entangle; to entrap.

> So will I turn her virtue into pitch;
> And out of her own goodness make the net
> That shall *enmesh* them all. *Shakspeare. Othello.*

ENNA, in ancient geography, the modern Castro Giovani, a city of Sicily, seated on an eminence in the middle of the island, whence, according to Diodorus, it was called the Navel of Sicily. It was one of the strongest places in the island, and remarkable for the beautiful plains, fruitful soil, and numerous lakes and springs, of its vicinity. Diodorus informs us, that Ceres was born in this district; and that she first taught the inhabitants of Enna the art of agriculture. He adds, that the rape of Proserpine by Pluto happened near Enna, while the young goddess was gathering flowers in a neighbouring meadow. The Enneans showed a large cavern, which, as they believed, opened of itself, to make the god a way to his infernal kingdom. Hence originated the worship which the Sicilians paid to these two divinities; the magnificent temple which Gelo erected to Ceres in this city; and the solemn festival, which the Syracusians annually celebrated near the fountain Cyane, supposed to have sprung up when the earth opened under Pluto's feet. The temple of Ceres was famous and resorted to from all parts. The waters of this neighbourhood were also in high repute for their limpidity and salubriousness.

ENNEACHORD, in ancient music, an instrument with nine strings.

ENNEACRUNOS, q. d. the nine fountains, in ancient geography, a fountain of Greece, in Attica, constructed by order of Pisistratus, at the foot of mount Hymettus, the waters of which were conveyed through nine pipes or channels into the town. See CYCLE OF THE MOON.

ENNEADECATERIS, in chronology, from *εννεα*, nine, and *δεκα*, ten, a cycle of nineteen years. The Jews, Athenians, and other nations, who wished to accommodate the lunar month to the solar year made use of this cycle; allowing to seven of the years thirteen, and to the rest, twelve months each.

ENNE'AGON, *n. s.* *Εννεα* and *γωνία*. A figure of nine angles.

ENNEAHEDRIA, in natural history, a genus of columnar, crystalliform, and double-pointed spars, composed of a trigonal column, terminated at each end by a trigonal pyramid. Of this genus there are several species, distinguished by the length or shortness of the column and pyramids, none of which give fire with steel, but all of them ferment with aquafortis. See SPAR.

ENNEANDRIA, in botany, from *εννεα*, nine, and *ανηρ*, a man. The ninth class in Linnæus's sexual system; consisting of plants which have hermaphrodite flowers with nine stamina or male organs. See BOTANY.

ENNERIS, in ancient ship-building, a name given to galleys, or vessels, which had nine tiers of rowers. They were of a very considerable size, and rose high above the water. The tesseracontes were a species of vessels of this fabric; that of Philopater had forty rows of oars, that of Ptolemy Philadelphus, had thirty; and some others which are spoken of, had twenty rows. It has been disputed, however, by many, whether such large vessels as these were ever actually built. Meibom gives great reason to believe that they really were, though he, at the same time, alleges against Salmasius, and the admirers of the works of the ancients, that very few vessels were built larger than these enneres, or nine tiered ones, and seems to prove it from Livy, Plutarch, and Polybius. This writer has given the rules of this ancient naval architecture, and is of opinion, that by imitating it at present, modern galleys and galleasses might be built much more conveniently both for strength, celerity, and cheapness.

ENNIS, the assizes town of the county of Clare in Ireland, is situated on the river Fergus, in the barony of Islands: it is a post, market, borough, and fair town; is 142 miles south-west of Dublin, and twenty-five from the city of Limerick. The population, twenty years ago, was rated at 9000, at present it does not amount to 7000. Here are a church, a Roman Catholic chapel, one Methodist meeting-house, an old market-house, and a handsome court-house, with a town-hall. A new gaol is just now erected, after the designs of Mr. Behan, and the old one converted into a linen hall. The chief trade consists of sales in corn, flannel, and linen. There is a permanent barrack at Clare Castle, two miles from Ennis, and a race course at Ballycorree, at which annual meetings are held in June. Good limestone, for building and for burning is readily procured in the vicinity. The charitable institutions are the County Infirmary and the Fever Hospital, to which may be added a poor-school of 100 children, supported by the London Hibernian Society. The great obstacle to the improvement of this town is the natural obstruction of the river Fergus. The suggestions for remedying this disadvantage are, either to cut a canal of sixty-four perches in length, from Ennis, by which means the Shannon boats might reach the town, while, at present, they only come to the port of Clare: or, to open a canal from Ennis to Scariff Bay in the Shannon. The first design, that of cutting through the rock at Clare, is decidedly preferable. Besides the public institutions and buildings already existing there is a diocesan, and two private classical schools in the town, and the inhabitants, generally, are attached to education.

ENNISCORTHY, a market, post, and fair town in the county of Wexford, in Ireland, on the river Slaney, situated seventy-six miles and a quarter from Dublin. It has a barrack for two companies of infantry, a church and glebe of twenty-three acres, a Roman Catholic chapel one Methodist, and one Quaker meeting-house. Here was an ancient abbey; and a very fine old castle is still in good preservation; it was built by king John, besieged by Cromwell in 1649, is now the property of lord Portsmouth, and is inhabited by his lordship's agent. Enniscorthy

being the head of the navigation, is a good market for corn, which is sent hence either to Wexford, seventeen miles, or to Ross, twenty-four miles, for exportation. The parish of Enniscorthy is a union of five, and contains about 12,000 acres, and a population of 4000 souls.

ENNISFALLEN, or INNISFALLEN, a luxuriant and beautiful isle in Killarney Lake, Kerry, Munster, containing about twenty-two acres, where travellers generally dine, in a sort of hall, fitted out by the proprietor, in one of the aisles belonging to an ancient abbey, now in ruins.

ENNISKILLEN, the chief town of the county of Fermanagh, in Ireland, is situated upon Lough Erne, partly in the barony of Magheraboy, and partly in that of Tyrkenedy. It is a borough, market, post, and fair, town, 100 English miles from Dublin, and thirty from Ballyshannon. The Enniskilleners occupy a remarkable place in the history of the civil wars in Ireland. There is a dragoon regiment, which is always recruited in this town, called the Enniskilleners; and the noble family of Cole derive the title of earls from this place. The town is situated on an island between the upper and lower lakes, and is approached by two good bridges, lately rebuilt. Here are the remains of the Maguires castle, now converted into an artillery barrack; a large but ancient church in a commanding situation; and an excellent market-house, adorned with a steeple built in 1792, and containing a spacious assembly-room. Contiguous to the market-house are the corn exchange and butter-market, the latter rebuilt in a handsome style by the corporation in 1807. The court-house is a respectable building, lately re-built, and adorned by a handsome, though rather heavy, portico in front. At the east entrance of the town stands the gaol, large and well-designed, but a grievous interruption to the otherwise beautiful scenery of the neighbourhood, being planted, in all its dismal, dreary, awkward, loneliness, in the very centre of the foreground in the view of Enniskillen. Near the gaol, but in a more elevated situation, stands the County Infirmary, a commodious and rather architectural building. The town consists of one long and well-proportioned street, with several smaller avenues at right angles to the main one. Enniskillen being the principal pass from Ulster to Connaught, easily defensible from its insular position, and possessing an excellent market, is made the head quarters of the military. The barrack here is extensive, but appears rather too low and too near the water to be healthy. There are many good houses in Enniskillen; many resident gentry; a public journal, spiritedly conducted and supported; annual balls; periodical theatricals; and yearly meetings on the race-course, which is about one mile from the town. The neighbourhood of Enniskillen is thickly inhabited by resident gentry, the beautiful scenery of Lough Erne attracting them to its banks. The villa of Killyhevlin, on the narrow channel between the lakes, is the most romantic and picturesque amongst many. One mile from the town is Castlecole, the seat of Lord Belmore. The house, considered the noblest private mansion in Ireland, is built of Portland stone, after a design of J. Wyatt, Esq. in 1791, at an expense of £100,000. The offices, built lately, are of yellow sand-stone, raised at the quarry of Slushill, of a durable quality, bright yellow color, and easily worked. This stone is not sufficiently appreciated by the Enniskilleners; perhaps, it was not much known until lately. It is admirably calculated for building, possessing a beautiful color, and is equal in all respects to Portland stone. To the west of the town, about a quarter of a mile distant, stands the endowed school of Portora. The house is spacious but the situation greatly exposed, nor can any hope of shelter be derived from plantations, as the house crowns the highest summit of the hill. At the foot of the hill, on which the school is erected, are the picturesque ruins of Portora Castle, once the palace of the bishops of Cloghan. In days of Irish chivalry these ruins witnessed the sacrifice of many victims at the altar of false honor. Portora Castle was the place of embarkation processions to Devinish Island.

When the intended improvements in the lake navigation shall have been completed, Enniskillen will, in all probability, increase rapidly in trade and population; it possesses already many natural advantages besides the protection of a munificent patron.

ENNIUS (Quintus), an ancient Latin poet, born at Rudii, a town in Calabria. He came first to Rome, when M. Portius Cato was questor, whom he had instructed in the Greek language in Sardinia, and by his genius gained the favor of the most eminent persons in the city. According to Horace, Ennius never applied himself to writing till he had drunk freely of wine. Hence he contracted the gout, of which he died, A.A.C. 9. He was interred in Scipio's sepulchre, who caused a statue to be erected to him upon his monument. He endeavoured to introduce the treasures of the Greek tongue among the Latins, and was the first among the Romans who made use of heroic verses. He wrote the Annals of Rome; he translated several tragedies from the Greek, and wrote others, besides several comedies. We have only some fragments of his works, which were first collected by the two Stephens, and afterwards published at Naples, with a learned commentary, by Jerom Columna, in 4to. 1590; and reprinted at Amsterdam in 1707, 4to. with additions by Hesselius.

ENNO'BLE, *v. a.* } From en and noble. Fr.
ENNOBLE'MENT, *n. s.* } *ennoblir;* Lat. *nobilis, à notum,* known. To raise to nobility; dignify; elevate; make famous or illustrious.

> Now, O thou sacred Muse! most learned dame,
> Fayre ympe of Phœbus and his aged bryde,
> The nourse of Time and everlasting Fame,
> That warlike handes *ennoblest* with immortall name.
> *Spenser. Faerie Queene.*

> Begin then, O my dearest sacred Dame,
> Daughter of Phœbus and of Memorye,
> That doest *ennoble* with immortall name,
> The warlike worthies from antiquitye,
> In the great volume of eternitye. *Somervile.*

> Many fair promotions
> Are given daily to *ennoble* those,
> That scarce some two days since were worth a noble.
> *Shakspeare.*

The Spaniards could not as invaders land in Ireland, but only *ennobled* some of the coasts thereof, with shipwrecks. *Bacon.*

He added, during parliament, to his former creations, the *ennoblement* or advancement in nobility of a few others. *Id.*

None so lovely, sweet and fair,
Or do more *ennoble* love. *Waller.*

The eternal wisdom enriched us with all *ennoblements*, suitable to the measures of an unstraitened goodness. *Glanville.*

—— Spite of all the fools that pride has made,
'Tis not on man a useless burthen laid;
Pride has *ennobled* some, and some disgraced;
It hurts not in itself, but as 'tis placed;
When right, its view knows none but virtue's bound;
When wrong, it scarcely looks one inch around.
*Stillingfleet.*

God raised up the spirit of this great person, and *ennobled* his courage and conduct with the entire overthrow of this mighty host. *South.*

What can *ennoble* sots, or slaves, or cowards?
Alas! not all the blood of all the Howards. *Pope.*

What does he not, from lusts opposed in vain,
And self-reproaching conscience? He foresees
The fatal issue to his health, fame, peace,
Fortune, and dignity; the loss of all,
That can *ennoble* man, and make frail life,
Short as it is, supportable. *Cowper.*

Ye Elements!—in whose *ennobling* stir
I feel myself exalted—can ye not
Accord me such a being? Do I err
In deeming such inhabit many a spot?
Though with them to converse can rarely be our lot.
*Byron.*

ENNON. See BEN-HINNOM.

ENNS, a populous town of Upper Austria, seated on an eminence near the confluence of the Enns and the Danube. It is well built, and fortified, having an arsenal and two castles. Inhabitants about 4400. Forty-two miles E. S. E. of Passau, and eighty west of Vienna.

ENNS, a river of Austria, which, rising in the duchy of Saltsburg, flows through Styria, and forms the boundary between Upper and Lower Austria. It falls into the Danube at the town of Enns, and is navigable in the lower part of its course, but it has several cataracts in Styria.

ENNUI, a French word almost naturalised, and used to express a listless state of insipidity and inactivity of body and mind. The aversion from ennui, or the desire of intellectual emotion, is described by Helvetius, in his work On Mind, as a very powerful and general spring of conduct.

ENOCH, the son of Jared and father of Methuselah, was born A. M. 622. At the age of sixty-five he begat Methuselah, and lived 300 years after, and had several sons and daughters. Enoch walked with God; and, after he had lived 365 years, 'he was not, for God took him.' Some construe these words, as if they intimated that Enoch died a natural death, because in reality he lived not near so long as the other patriarchs of those times; or as if God, to secure him from corruption, had taken him early out of this world. But the generality of the fathers and commentators assert that he died not, but was translated out of the sight of men, as Elijah was. The apostle Paul shows very clearly that Enoch was translated, and did not see death. Heb. xi. 5. The Rabbis maintain that, when Enoch was translated to heaven, he was admitted into the number of the angels, and is the person generally known by the name of Michael.

ENOCH, THE PROPHECY OF, an apocryphal book, ascribed to Enoch. That Enoch was a prophet will admit of no doubt; he named his son Methuselah (מות, he dieth, and שלח, it, or he, cometh), in this character; and Methuselah died in the same year in which vengeance was executed on the old world by the coming of the flood. The apostle Jude cites the language of Enoch, ver. 14, 15, but upon this passage interpreters have been very much divided; and the question has been, Whether the apostle took this passage out of any particular book written by Enoch, which might be extant in the first ages of the church? whether he received it by tradition? or lastly, by some particular revelation? Some have supposed, that he read it in the book ascribed to Enoch, which, though apocryphal, might contain several truths that St. Jude, who was favored with a supernatural degree of understanding, might make use of to the edification of the faithful. The ancients greatly esteemed this work. Tertullian expresses his concern, that it was not generally received. St. Augustin allows, indeed, that Enoch wrote something divine, because he is cited by St. Jude: but he says that the authority of this book is doubtful, and that it cannot be proved that it was really written by Enoch. It lay a long time buried in oblivion, till the learned Joseph Scaliger recovered a part of it. Scaliger, Vossius, and other learned men, attribute this work to one of those Jews who lived between the time of the Babylonish captivity and that of Jesus Christ. Others are of opinion, that it was written after the rise and establishment of Christianity, by one of those fanatics with whom the primitive church was filled, who made a ridiculous mixture of the Platonic philosophy and the Christian divinity. Enoch is famous even in heathen story: the eastern writers, Arabic and Persian, speak very highly of the prophet Enoch or Edris, as they call him; they say he received from God the gift of wisdom and knowledge; and that God sent him thirty volumes from heaven, filled with all the secrets of the most mysterious sciences. Upon the writings of these eastern authors, the book called the Prophecy of Enoch was probably fabricated.

ENOCH, in ancient geography, a city said to have been built by Cain in the land of Nod where he and his family settled, and called after the name of his son Enoch. Gen. iv. 16, 17. Moses places it, according to our translation, on the east of Eden; and Ptolemy mentions a city called Anuchtha in Susiana, or Chusistan, a country lying eastward from Chaldea, which the learned Huet supposes to have been the same with that built by Cain. But it seems very improbable that the city of Enoch, built before the flood, should either withstand the deluge or retain its ancient name, after so great a change in the surface of the earth. Besides, Susiana being a very fertile and pleasant country, it is not likely that Cain should be banished thither, but rather to some barren and desolate land, remote

om the place of his nativity, and separated by mountains, or other natural impediments, from intercourse with his relations. As there was another Enoch (see the preceding article) besides the son of Cain, it is not improbable that the city Anuchtha, mentioned by Ptolemy, might have taken its name from him, whose memory would be held in veneration, or from some other Enoch or Anoch, who might have lived after the flood. Grotius and Junius are of opinion, that the country into which Cain retired was the desart of Arabia; but as this country lies on the west, and not on the east of Eden, it is said, that the words which we translate 'on the east' of Eden signify nothing more than 'before' or 'over against' Eden, according to the translation of the Septuagint. According to this opinion, the land of Nod must have been Arabia Deserta, or some part of it, and not Susiana. *Wells's Sacred Geography.*

ENOR'MITY, *n. s.* } Fr. Ital. and Span.
ENOR'MOUS, *adj.* } *enorme*; Lat. *enormis*,
ENOR'MOUSLY, *adv.* } *e* and *norma*, a builder's
ENOR'MOUSNESS, *n. s.* } square. State of being beyond rule or law; hence great depravity; gross corruption: enormous is out of rule; beyond measure; irregular.

O heartless fooles, haste here to our doctrine,
Leaue off the wayes of your *enormitie*. *Barclay.*

We shall speak of the particular abuses and *enormities* of the government. *Spenser. State of Ireland.*

That this law will be always sufficient to bridle or restrain *enormity*, no man can warrant. *Hooker.*

I shall find time
From this *enormous* state, and seek to give
Losses their remedies.
*Shakspeare. King Lear.*

Wallowing, unwieldy, *enormous* in their gait.
*Milton.*

Nature here
Wantoned, as in her prime; and played at will
Her virgin fancies, pouring forth more sweets,
Wild above rule, or art, *enormous* bliss! *Id.*

There are many little *enormities* in the world, which our preachers would be very glad to see removed; but at the same time dare not meddle with them, for fear of betraying the dignity of the pulpit.
*Addison's Guardian.*

One who could never espouse a notion so *enormously* absurd and senseless, as that the world was framed by chance. *Woodward.*

When those who have no opportunity to examine our faith, see the *enormousness* of our works, what should hinder them from measuring the master by the disciples? *Decay of Piety.*

The *enormous* part of the light in the circumference of every lucid point, ought to be less discernible in shorter telescopes than in longer, because the shorter transmit less light to the eye. *Newton's Opticks.*

It is not a bare speculation that kings may run into *enormities*; the practice may be proved by example.
*Swift.*

A giant shepherd here his flock maintains,
Far from the rest, and solitary reigns,
A form *enormous!* far unlike the race
Of human birth, in stature, or in face.
*Pope's Odyssey.*

I say it is impossible that so sensible a people, under such circumstances, should have lived so long by the smoky, unwholesome, and *enormously* expensive light of candles. *Franklin.*

The envy and discord which were introduced into the families of Jacob and Elkanah, by a plurality of wives, are but imperfect pictures of the *enormities* occasioned by the same practise under masters less virtuous, and in ages more dissolute and luxurious.
*Robertson's Sermons.*

Thus harmony and family accord
Were driven from Paradise; and in that hour
The seeds of cruelty, that since have swelled
To such gigantic and *enormous* growth,
Were sown in human Nature's fruitful soil.
*Cowper.*

And even where Nature loads the teeming plain
With the full pomp of vegetable store,
Her bounty, unimproved, is deadly bane:
Dark woods and rankling wilds, from shore to shore,
Stretch their *enormous* gloom. *Beattie.*

And yet vice, however it may surprise by its novelty or *enormity*, is by no means an object of laughter, even to those who perceive in it all the absurdities I have specified. *Id.*

ENOS, the son of Seth, and father of Cainan was born, A.M. 235. Moses tells us, Gen. iv. 26, that then 'men began to call upon the name of the Lord;' or, as others translate it, that 'Enos began to call upon the name of the Lord;' or was the first observer of social rites and ceremonies in external worship. This worship was kept up and preserved in Enos's family, while Cain's was plunged in all kinds of immorality and impiety. Several Jews are of opinion, that idolatry was first introduced into the world in the time of Enos. They translate the Hebrew thus, 'Then men began to profane the name of the Lord.' Good men, to distinguish themselves from the wicked, began to take upon them the quality of sons or servants of God; for which reason, Moses, Gen. vi. 1, 2, says, that the sons of God, that is to say the descendants of Enos, who had hitherto preserved the true religion, seeing the daughters of men, that they were fair, took them wives of all which they chose. Enos died at the age of 905; A.M. 1140.

ENOUGH', *adj. n. s.* & *adv.* Sax. ȝenoh; Goth. *ganah*; Dut. and Teut. *ghenog*; Swed. *gnog*; Ang.-Sax. genoȝ, according to H. Tooke, from the past participle *genoged*, of the verb *geno gan*, to increase. Minsheu derives it through the Gr. ἱκανος, sufficient, from Heb. ענג, ghanagh, to satisfy. In sufficient measure or degree; so as to satisfy or suffice. As a substantive, that which satisfies or suffices: as an adverb, in a sufficient degree. It slightly qualifies also by augmentation or diminution, as in the phrases good or well enough: enow is its plural.

The walls of the church there are *enow* contented to build; the marbles are polished, the roofs shine with gold, the alter hath precious stones to adorn it, and of Christ's ministers no choice at all. *Hooker.*

RICH. Why do we linger thus? I cannot rest,
Untill the white rose that I weare, be dyede
Euen in the luke-warme blood of Henries heart.
YORKE. Richard, *ynough*: I will be King, or dye.
*Shakspeare's King Henry VI. Part 3.*

Henceforth, I'll bear
Affliction 'till it do cry out itself,
*Enough, enough*, and die.
*Shakspeare. King Lear.*

I am apt *enough* to think, that this same binarium of a stronger and a weaker, like unto masculine and feminine, doth hold in all living bodies. *Bacon.*

And then, as tho' she could not make *enow*,
Himself his various rainbow did allow. *Donne.*

If three days were little *enough* to prepare them to receive the law, how is all our life short *enough* to prepare for the reckoning of our observing it? *Bp. Hall's Contemplations.*

Balàc and his Moabites had wit *enough* to fear, not wit *enough* to prevent judgment. *Id.*

Man had selfish foes *enow* besides,
That, day and night, for his destruction wait. *Milton.*

He hath riches sufficient, who hath *enough* to be charitable. *Sir T. Browne.*

'Tis *enough* for me to have endeavoured the union of my country, whilst I continued in public employments. *Temple.*

The earth hath since born *enow* bleeding witnesses, that it was no want of true courage. *Sidney.*

My conquering brother will have slaves *enow*
To pay his cruel vows for victory. *Dryden.*
Why would'st thou go, with one consent they cry,
When thou hast gold *enough*, and Emily? *Id.*

When there was not room *enough* for their herds, they by consent separated, and enlarged their pasture. *Locke.*

It is sometimes pleasant *enough* to consider the different notions which different persons have of the same thing. *Addison.*

There are at Rome *enow* modern works of architecture to employ any reasonable man. *Id.*

They are now in prison at Florence; and, as it is said, treated hardly *enough*. *Id. on Italy.*

It would be *enough* to damp their warmth in such pursuits, if they could once reflect, that in such course they will be sure to run upon the very rock they mean to avoid. *Swift.*

*Enough* for me that to the list'ning swains,
First in those fields I sung the silvan strains. *Pope.*

O grant me, heaven, a middle state,
Neither too humble nor too great;
More than *enough* for nature's ends,
With something left to treat my friends. *Mallet.*

Young men are apt to think themselves wise *enough*, as drunken men are apt to think themselves sober *enough*. *Chesterfield.*

I have seen *enough* of presuming ignorance, never to venerate wisdom but where it actually appears. *Goldsmith.*

Public securities are with us become a kind of money, and pass as readily at the current price as gold or silver. Wherever any profitable undertaking offers itself, however expensive, there are never wanting hands *enow* to embrace it. *Hume.*

Similar to this if on a foggy night a person turns his back to a candle and lanthorn, he will see a monstrous shadow of himself delineated on the fog, which is dense *enough* to reflect a part of the candle-light in the vicinity of the shadow. *Darwin.*

ENPIE'RCE, *v. a.* From en and pierce. To transfix.

I am too sore *enpierced* with his shaft
To soar with his light feathers. *Shakspeare.*

ENRAGE'. Fr. *enrager*; en and RAGE, which see. To irritate; provoke highly.

The justice of their quarrel should not so much encourage as *enrage* them, being to revenge the dishonour done to their king, and to chastise deceitful enemies. *Hayward.*

*Enraged* at this, upon the bawd I flew;
And that which most *enraged* me was, 'twas true. *Walsh.*

His system of reformation satisfied none of his subjects. Some were *enraged* because he had proceeded so far, others murmured because he proceeded no farther. *Robertson's History of Scotland.*

ENRA'NGE, *v. a.* From en and range. To place regularly; to put into order.

As fair Diana, in fresh summer's day,
Beholds her nymphs *enranged* in shady wood. *Faerie Queene.*

ENRA'NK, *v. a.* From en and rank. To place in orderly ranks.

No leisure had he to *enrank* his men. *Shakspeare.*

ENRAPT', *v. a.* }
ENRAP'TURE, *v. a.* } Lat. *raptare*; to carry off or away. To transport with ecstasy or pleasure. See RAPT.

I myself
Am, like a prophet, suddenly *enrapt*
To tell thee, that this day is ominous. *Shakspeare.*

Nor hath he been so *enrapt* in those studies as to neglect the polite arts of painting and poetry. *Arbuthnot and Pope.*

If his general thoughts on women were such as he exhibits, a very little sense in a lady would *enrapture*, and a very little virtue would astonish him. *Johnson's Life of Swift.*

There is scarcely any earthly object gives me more —I do not know if I should call it pleasure—but something which exalts me, something which *enraptures* me—than to walk in the sheltered side of a wood, or high plantation, in a cloudy winter day, and hear the stormy wind howling among the trees, and raving over the plain. *Burns.*

Ye winged hours that o'er us past,
*Enraptured* more, the more enjoyed,
Your dear remembrance in my breast,
My fondly-treasured thoughts employed. *Id.*

Charmed with her words the Muse astonished stands,
The Nymphs *enraptured* clasp their velvet hands. *Darwin.*

Fret not thyself, thou glittering child of pride,
That a poor villager inspires my strain:
With thee let Pageantry and Power abide,
The gentle Muses haunt the sylvan reign;
Where through wild groves at eve the lonely swain
*Enraptured* roams, to gaze on Nature's charms. *Beattie.*

ENRAV'ISH, *v. a.* }
ENRAV'ISHMENT, *n. s.* } From en and ravish. To throw into ecstasy or delight: to transport with pleasure.

What wonder,
Frail men, whose eyes seek heavenly things to see,
At sight thereof, so much *enravished* be? *Spenser.*

They contract a kind of splendor from the seemingly obscuring vail, which adds to the *enravishments* of her transported admirers. *Glanville's Scepsis.*

ENRHE'UM, *v. n.* Fr. *enrhumer*. To have rheum through cold.

The physician is to enquire where the party hath taken cold or *enrheumed*. *Harvey.*

ENRICH', *v. a.* }
ENRICH'MENT, *n. s.* } Fr. *enricher*; Ital. *arrichère*; Span. *enriquecer*; from en and rich. To make wealthy or productive; to fertilise; and figuratively, to store the mind with knowledge.

The king will *enrich* him with great riches, and will give him his daughter. 1 *Sam.* xvii. 25.

Henry is able to *enrich* his queen,
And not to seek a queen to make him rich. *Shakspeare.*

There is not any one among them that could ever enrich his own understanding with any certain truth, or ever edify others therein. *Raleigh's History.*

I have procured a translation of that book into the general language, not without great and ample additions, and *enrichment* thereof. *Bacon's Holy War.*

Great and glorious Rome, queen of the earth,
So far renowned, and with the spoils *enriched*
Of nations. *Milton's Paradise Regained.*

Those are so unhappy as to rob others, without *enriching* themselves. *Denham.*

See the sweet brooks in silver mazes creep,
*Enrich* the meadows, and supply the deep.
*Blackmore.*

The dunghil having raised a huge mushroom of short duration, is now spread to *enrich* other men's land. *Swift.*

As words grow old, and new ones *enrich* the language, so there is a constant succession of dress. *Gay.*

It is a vast hindrance to the *enrichment* of our understandings, if we spend too much of our time and pains among infinities and unsearchables. *Watts.*

Henry undermined his barons by encouraging them to sell their lands, which *enriched* the commons, and gave weight in the legislature unknown to their predecessors. *Robertson's History of Scotland.*

Here ragged Avarice guards with bolted door
His useless treasures from the starving poor;
Loads the lorn hours with misery and care,
And lives a beggar to *enrich* his heir. *Darwin.*

In the foolishness of their hearts, they imagined that the maintenance and well doing of the industrious poor were objects of greater consequence than the *enrichment* of a few individuals, by any improvement in the implements of trade which threw the workmen out of employment, and rendered the labourer unworthy of his hire. *Byron.*

Enriching Plants, a term used by Tull and other farmers to designate such plants as are found to improve land, rather than to exhaust it, and in consequence of which the same piece of land will produce a good crop of corn, though it would, without the assistance of their having been planted on it, have yielded a very poor one. The mystery of this difference between plants, some of which are found to burn up, that is, impoverish lands, while others enrich it, and leave it fitter for succeeding crops than they found it, is explained by Mr. Tull. This author having observed, that breaking the earth, by digging or horse-hoeing between the plants, gave them great increase, found that it was this practice that enriched the earth: and that, while corn and such plants as stand close, and cannot be hoed between, impoverish the ground, and suffer no means of enriching it again to be used, there were some other things, the crops of which being planted thinner, gave room to the earth to be ploughed, dug, or hoed between, and that these were the plants which were called the enriching kind by the farmers; and the whole secret lay in this, that the hoeing, ploughing, or otherwise breaking the earth between them, in order to kill the weeds, enriched the ground greatly more, in proportion, than these plants exhausted it; and the consequence was, that though they had thriven very well, yet the earth was left richer than before, notwithstanding all that they had imbibed from it.—*Tull's Horse-hoeing Husbandry.*

ENRID'GE, *v. a.* From ridge. To form with longitudinal protuberances or ridges.

He had a thousand noses,
Horns walked and waved like the *enridged* sea:
It was some fiend. *Shakspeare. King Lear.*

ENRI'NG, *v. a.* From ring. To bind round; to encircle.

Ivy so
*Enrings* the barky fingers of the elm. *Shakspeare.*

ENRI'PEN, *v. a.* From ripe. To ripen; to mature; to bring to perfection.

The Summer, how it *enripened* the year:
And Autumn, what our golden harvests were.
*Donne.*

ENRO'BE, *v. a.* From robe. To dress; to clothe; to habit; to invest.

Her mother hath intended,
That, quaint in green, she shall be loose *enrobed*,
With ribbands pendant, flaring 'bout her head.
*Shakspeare.*

ENROL', *v. a.* } From en and roll. Fr.
Enrol'ment, *n. s.* } *enroller.* To involve; enwrap; to enter or insert on a roll; hence to record or leave in writing: an enrolment is either the act of enrolling, or the register or record made.

There be *enrolled* amongst the king's forces about thirty thousand men of the Jews. 1 *Mac.* x. 36.

From his infernal furnace forth he threw
Huge flame, that dimmed all the heaven's light,
*Enrolled* in duskish smoak and brimstone blue.
*Faerie Queene.*

He swore consent to your succession;
His oath *enrolled* in the parliament.
*Shakspeare.*

As God is careful to maintain the glory of his miraculous victory, so is Moses desirous to second him; God by a book, and Moses by an altar and a name. God commands to *enrol* it in parchment; Moses registers it in the stones of his altar.
*Bp. Hall's Contemplations.*

The king himself caused to be *enrolled*, and testified by a notary publick; and delivered the *enrolments*, with his own hands, to the Bishop of Salisbury.
*Davies on Ireland.*

Laws, which none shall find
Left them *enrolled*; or what the spirit within
Shall on the heart engrave.
*Milton's Paradise Lost.*

The champions, all of high degree,
Who knighthood loved, and deeds of chivalry,
Thronged to the lists, and envyed to behold
The names of others, not their own *enrolled*.
*Dryden.*

We find ourselves *enrolled* in this heavenly family as servants, and as sons. *Sprat.*

Heroes and heroines of old,
By honour only were *enrolled*
Among their brethren of the skies;
To which, though late, shall Stella rise.
*Swift.*

Mentes, an ever-honoured name of old,
High in Ulysses' social list *enrolled*.
*Pope's Odyssey.*

Enrolment, in military affairs, signifies the registering of such persons as, being enlisted, or appointed, are placed upon the rolls of any particular regiment, troop, or portion of the military establishment. The act of enrolment seems to be held necessary in proof of a soldier's having become a servant of the state; equally so with the circumstance of his having received pay,

or some money, however trifling, in advance. For it does not appear reasonable, that a soldier should be punished for absenting himself from that employ in which he has not received either pay or subsistence. It is not, however, to be understood, that, after being duly enlisted in the presence of a magistrate, the recruit is at liberty to quit the party by whom he has been entertained: far otherwise; but enrolment is necessary to his being fully treated as a soldier. In some instances, especially in the service of the East India Company, the whole of the recruits are lodged at a general depôt, under the charge of officers, but without being attached to any particular regiment until their arrival in India: in the mean while they are formed into squads, under the immediate control of non-commissioned officers, by whom they are trained in the rudiments of military discipline. We cannot with strict propriety say, that such men are enrolled; nor, indeed, is this term applicable until they are in a certain degree fixed in some particular company, and entered upon its muster-roll, as well as upon the long-roll of the regiment.

ENRO'OT, *v. a.* From root. To fix by the root; to implant deep.

> He cannot so precisely weed this land,
> As his misdoubts present occasion:
> His foes are so *enrooted* with his friends,
> That, plucking to unfix an enemy,
> He doth unfasten so and shake a friend.
> *Shakspeare.*

ENRO'UND, *v. a.* From round. To environ; to surround; to encircle; to enclose.

> Upon his royal face there is no note
> How dread an army hath *enrounded* him.
> *Shakspeare.*

ENS, *n. s.* } Lat. *ens, entitas*, from Gr. *ειναι*,
ENT'ITY. } to be. Being; essence; a particular species of being.

All eruptions of air, though small and slight, give an *entity* of sound, which we call crackling, puffing, and spitting; as in bay salt and bay leaves, cast into the fire. *Bacon.*

> — Humour (as 'tis *ens*) we thus define it
> To be a quality of aqua water;
> And, in itself, holding these properties,
> Moisture or fluxure. *Ben Jonson.*

God's decrees of salvation and damnation, both Romish and reformed affix to men's particular *entity*, absolutely considered without any respect to demeanours. *Hammond's Fundamentals.*

> Here *entity* and quiddity,
> The souls of defunct bodies fly.
> *Hudibras.*

> Dear hope, earth's dowry and heaven's debt,
> The *entity* of things that are not yet:
> Subt'lest, but surest being. *Crashaw.*

Fortune is no real *entity*, nor physical essence, but a mere relative signification. *Bentley.*

> But Reproduction, when the perfect Elf
> Forms from fine glands another like itself,
> Gives the true character of life and sense,
> And parts the organic from the chemic *Ens.*
> *Darwin.*

ENS POSITIVUM, and ENS REALE, terms used in the schools by metaphysicians, synonymously with ens, for entity, as above defined, by way of distinction from

ENS RATIONIS, an imaginary being, or a thing that exists only in the imagination.

ENS, or ENNS, in geography, a river and also a town of Germany. See ENNS.

ENSAF'FRON, *v. a.* From en and saffron; Fr. *safran;* Ital. *zafferano;* which according to Junius is from Gr. *ζαφραιν-ειν*, to exhilarate. To make or color like saffron; to make of a deep yellow color.

> Phœbus in the chair,
> *Ensaffroning* sea and air,
> Makes vanish every star. *Drummond.*

ENSA'MPLE, *n. s.* & *v. a.* Old. Fr. *ensample;* Ital. *essempio.* See EXAMPLE, which is now used. Pattern; subject of; imitation. The verb is used by Spenser for to exemplify.

Therfore if I Lord and maister, haue waishun youre feet, and ye schulen waische oon anotheris feet. For I haue gouun *ensaumple* to you, that as I haue don to you, so do ye. *Wiclif. Jon.* 13.

Ye have us for an *ensample.* *Phil.* iii. 17.

> Such life should be the honour of your light;
> Such death, the sad *ensample* of your night.
> *Spenser.*

I have followed all the ancient poets historical first, Homer, who, in the person of Agamemnon *ensampled* a good governor and a virtuous man. *Spenser.*

Such as would be willing to make use of our *ensample* to do the same thing, where there is not the same necessity, may not be able to vouch our practice for their excuse. *Sanderson.*

ENSA'NGUINE, *v. a.* Lat. *sanguis;* Fr. *ensanglanter.* To smear with gore; to suffuse with blood.

> With cruel tournament the squadrons join,
> Where cattle pastured late; now scattered lies,
> With carcasses and arms, the *ensanguined* field
> Deserted. *Milton's Paradise Lost.*

> Then sudden all the base ignoble crowd,
> Loud clamouring, seize the helpless, worried, wretch,
> And, thirsting for his blood, drag different ways
> His mangled carcass on the' *ensanguined* plain.
> *Somervile.*

ENSCHE'DULE, *v. a.* From schedule. To insert in a schedule or writing.

> You must buy that peace
> With full accord to all our just demands,
> *Enscheduled* here. *Shakspeare. Henry V.*

ENSCO'NCE, *v. a.* From en and sconce. To cover as with a fort; to secure.

I myself sometimes, hiding mine honour in my necessity, and fain to shuffle, to hedge, and to lurch; and yet your rogue will *ensconce* your rags, your cat-a-mountain looks under the shelter of your honour. *Shakspeare.*

We make trifles of terrours, *ensconcing* ourselves in seeming knowledge. *Id.*

She shall not see me, I will *ensconce* me behind the arras. *Id. Merry Wives of Windsor.*

> A sort of error to *ensconce*
> Absurdity and ignorance. *Hudibras.*
> This he courageously invaded,
> And having entered barricadoed,
> *Ensconced* himself as formidable
> As could be, underneath a table. *Id.*

ENSE'AM, *v. a.* From en and seam. To sew up; to enclose by a seam or juncture of needlework.

A name engraved in the revestiary of the temple, one stole away, and *enseamed* it in his thigh. *Camden.*

ENSEA'R, *v. a.* From en and sear. To cauterise; to stanch or stop with fire.

*Ensear* thy fertile and conceptious womb;
Let us no more bring out t' ingrateful man. *Shakspeare.*

ENSEMBLE (Fr. together). In music this adverb has been used substantively, and received in the French musical technica, according to Rousseau, with a very extensive signification. To regard an object in its ensemble or totality, is to consider the effect which the several parts produce when united in a whole. It is only in the execution of a piece of music that this term is applicable, when the performers are so perfectly together in time and tune, seeming to be all so much animated by one soul, that they communicate exactly to the ear, all that the eye can see in the score.

The being *ensemble*, or together, does not merely depend on the accuracy with which each reads his part, but in the intelligence with which he feels its peculiar character and connexion with the whole; whether in the exactitude of phraseology, the precision of the movements, or seizing the instant and degree of pianos and fortes: or finally, in the nice attention to such ornaments, which the author has thought so necessary as to be indispensable. It is in vain for musicians to have abilities, they can never be together without an intelligence of the author's designs, and perfectly understanding each other: for it would be impossible to keep together a band of performers that are deaf, or in the execution of music in a style with which they are totally unacquainted. It belongs to the masters, conductors, and leaders of an orchestra, to guide, check, or accelerate individual performers, and to keep them together in the aggregate, which is always the office of a judicious first violin, who, by a certain firmness and energy in his manner, strongly impresses the character of the piece in every ear. The vocal part is subordinate to the base and the time: the first violin ought to watch and follow the voice; the repienos should listen to, and be guided by, the first violin: and, finally, the harpsichord or piano-forte, at an opera where the composer is supposed to sit, should be the principal and most important guide of the whole. In general, the more character there is in the style, periods, phrases, melody, and harmony, the more easy it will be to seize the ensemble; because the same idea, strongly impressed on all minds, will preside in the whole execution. On the contrary, when the music says nothing, and nothing is heard but a succession of notes without meaning, then, as there is no whole to which each performer can refer his part, the ensemble goes ill. This (says M. Rousseau) was the reason why French performers could never be together.

ENSEELED, in falconry, a term applied to a hawk that has a thread drawn through her upper eye-lid, and made fast under her beak, to take away the light.

ENSHIELD, *v. a.* From en and shield. To shield; to cover; to protect.

These black masks
Proclaim an *enshield* beauty, ten times louder
Than beauty could display. *Shakspeare.*

ENSHRI'NE, *v. a.* From en and shrine. To enclose in a chest or cabinet; to preserve and secure as a thing sacred.

He seems
A phœnix, gazed by all, as that sole bird,
When to *enshrine* his reliques in the sun's
Bright temple, to Egyptian Thebes he flies. *Milton.*

The sots combine
With pious care a monkey to *enshrine.* *Tate's Juvenal.*

Fair fortune next, with looks serene and kind,
Receives 'em, in her ancient fane *enshrined.* *Addison.*

Ambition searches all its sphere
Of pomp and state, to meet thee there.
Increasing avarice would find
Thy presence in its gold *enshrined.* *Parnell.*

EN'SIENT, *adj.* Fr. *enceinte.* Pregnant.

A. died without issue born, but leaving his wife *ensient*, or big with child. *Blackstone.*

ENSIGN', *n. s.* } Fr. *enseigne;* Span.
ENSIGN'-BEARER, *n. s.* } *ensena;* Ital. *insegna*, from Lat. *insigne*, i. e. *in* and *signum*, a mark or sign. The standard flag, or badge of a regiment; any signal or badge: the officer who carries the ensign.

He will lift up an *ensign* to the nations from far. *Isaiah* v.

The Turks still pressing on, got up to the top of the walls with eight *ensigns*, from whence they had repulsed the defendants. *Knolles's History.*

Hang up your *ensigns*, let your drums be still. *Shakspeare.*

Instead of lifting up their *ensigns* and marching towards Canaan, they sit them down and lift up their voice and cry. *Bp. Hall's Contemplations.*

If it be true that the giants ever made war against heaven, he had been a fit *ensignbearer* for that company. *Sidney.*

Princes that fly, their sceptres left behind,
Contempt or pity, where they travel, find;
The *ensigns* of our power about we bear,
And every land pays tribute to the fair. *Waller.*

The marks or *ensigns* of virtues contribute, by their nobleness, to the ornament of the figures; as the decorations belonging to the liberal arts, to war, or sacrifices. *Dryden.*

Men taking occasion from the qualities, wherein they observe often several individuals to agree, range them into sorts, in order to their naming under which individuals, according to their conformity to this or that abstract idea, come to be ranked as under *ensigns.* *Locke.*

Right, says an *ensign;* and, for ought I see,
Your faith and mine substantially agree;
The best of every man's performance here
Is to discharge the duties of his sphere. *Cowper.*

ENSIGN. See COLORS, FLAG, STANDARD, &c. The Turkish ensigns are horses' tails; those of the Europeans are of silk, with various figures colors, arms, and devices thereon.

*The* ENSIGN is the lowest commissioned officer in a company of foot, subordinate to the captain and lieutenant. It is a very honorable post for a gentleman at his first coming into the army: he is to carry the colors both in assault, day of battle, &c., and should not quit them

but with his life: he must always carry them himself on his left shoulder: only on a march he may have them carried by a soldier. If the ensign is killed, the captain must carry the colors in his stead.

Though there are two stands of colors to each regiment, only one of them is properly called 'the ensign.' The flag, consisting of the union only, is called the king's color, and always takes post of the other, which being in general of the same color as the facings of the corps, and bearing any device or motto, by which it is distinguished, is appropriately called 'the regimental ensign.' In case of defeat, the ensigns bearing the colors were once instructed very carefully to collect as many of the fugitives as possible, for the purpose of rallying the corps, or, at least, of preventing it from being further disgraced by the loss of their facings, which formerly was an inseparable consequence annexed to the loss of the colors. This regulation must often have produced considerable enthusiasm; as we may reasonably conclude, that the attack made by a regiment under such a privation, (which could only be remedied by its taking the colors of its opponents), must be of the most arduous description.

Ensign, Naval, a large standard, or banner, hoisted on a large pole, erected over the poop, and called the ensign staff. The ensign is used to distinguish the ships of different nations from each other; and to characterise the different squadrons of the navy. The display of an ensign in presence of a strange sail is considered a mark of civility during time of peace, and in time of war serves to distinguish between friends and foes. During the latter period, such vessels as do not hoist their ensigns may be reasonably suspected to be privateers, or to be desirous of evading every kind of communication. So long as the ensign remains hoisted, during an engagement, the ship is to be considered in a state of defiance; but when it is lowered, she is said to strike; that is, to give up the contest, and to submit, as a prize to her opponent. It occasionally happens that a ship's ensign staff, or the haul-yards by which the ensign is hoisted to the mizen-peak, is shot away; this does not indicate submission; on the contrary, the annals of warfare exhibit many instances of extraordinary courage in individuals, who, at such moments, have run aloft, or even stood on the poop, there to sustain a portion of the ensign as a token of the most determined opposition.

In the British service are three ensigns, namely, the white, the red, and the blue; the first is divided into equal portions, by a broad St. George's cross of red, of which the upper canton, or quarter, is filled up with the union. The second and third are both plain, with the exception of the union in the same canton. These indicate the rank of the admiral under which a ship of war is commissioned or employed. Thus, an admiral of the white bears a white, or, as it is commonly called, a St. George's ensign, at the main top-gallant mast head; a vice-admiral of the white has one at the fore-top gallant mast head; and a rear-admiral one at the mizen top-gallant mast head: the same rules of precedence obtain, with the admirals, vice-admirals, and rear-admirals of the red and blue respectively; each bearing a flag of his proper color at that mast head corresponding with his rank. When fleets are separated into squadrons or divisions, each ship assumes for the time the ensign of that admiral who commands the squadron, or division, in which it acts. The same is observed by all vessels acting under any particular port-admiral; all under his authority invariably bearing an ensign conformable to his designation, whether of the white, red, or blue.

*Of* Ancient Ensigns, that of the Persians, according to Xenophon, was a golden eagle on a white flag; the Corinthians bore a Pegasus, or winged horse, on theirs; the Athenians an owl; the Messenians, the Greek letter M; the Lacedæmonians, the A. The Romans had a great diversity of ensigns; the wolf, minotaur, horse, boar, and at length the eagle, which they retained: this was first assumed in the second year of the consulate of Marius. See Eagle. In the rustic age of Rome, the ensign was nothing more than a wisp of hay carried on a pole, as the word manipulus properly signifies. The ensign of the horse was not solid, as the others, but consisted of a cloth, somewhat like our colors, distended on a staff; on which the names of the emperors were generally inscribed. The religious care the soldiers took of their ensigns was extraordinary: they worshipped them, swore by them, and incurred certain death if they lost them. The Turks and Tartars make use of horses' tails for their ensigns, whose number distinguishes the rank of their commanders: for the sultan has seven, and the grand vizier only three, &c.

ENSLAVE', *v. a.* } From en and slave.
Enslave'ment, *n. s.* } To reduce to servitude;
Enslav'er. } deprive of freedom; make over as a slave: enslavement is the state of servitude or slavery: enslaver, he who reduces another to slavery.

No man can make another man to be his slave, unless he hath first *enslaved* himself to life and death, to pleasure or pain, to hope or fear: command those passions, and you are freer than the Parthian king.
*Taylor's Rule of Holy Living.*

The conquered also, and *enslaved* by war,
Shall, with their freedom lost, their virtue lose.
*Milton.*

The more virtuously any man lives, and the less he is *enslaved* to any lust, the more ready he is to entertain the principles of religion. *Tillotson.*

Long draughts of sleep his monstrous limbs *enslave*;
He reels, and falling fills the spacious cave.
*Dryden.*

A man, not having the power of his own life, cannot by compact, or his own consent, *enslave* himself to any one, nor put himself under the absolute arbitrary power of another, to take away life when he pleases.
*Locke.*

He is certainly the most subjected, the most *enslaved*, who is so in his understanding. *Id.*

The children of Israel, according to their method of sinning, after mercies, and thereupon returning to a fresh *enslavement* to their enemies, had now passed seven years in cruel subjection. *South.*

While the balance of power is equally held, the ambition of private men gives neither danger nor fear, nor can possibly *enslave* their country. *Swift.*

What indignation in her mind,
Against *enslavers* of mankind! *Id.*

The English considered the Scots as vassals who had presumed to rebel; and the Scots, in their turn, regarded the English as usurpers who aimed at *enslaving* their country.
*Robertson's History of Scotland.*

His country's wrongs, and his despair to save her,
Had stung him from a slave to an *enslaver*. *Byron.*

ENSNARE', *v. a.* From en and snare. To entrap; to bring into snares or difficulties.

Is there, in human form, that bears a heart
A wretch! a villain! lost to love and truth!
That can, with studied, sly, *ensnaring* art,
Betray sweet Jenny's unsuspecting youth?
*Burns.*

There, proof against prosperity, awhile
They stood the test of her *ensnaring* smile,
And had the grace in scenes of peace to show
The virtues they had learned in scenes of woe.
*Cowper.*

Can selfishness the liberal heart control?
Is glory there achieved by arts, as foul
As those that felons, fiends, and furies plan?
Spiders *ensnare*, snakes poison, tygers prowl;
Love is the godlike attribute of man.
O teach a simple youth this mystery to scan.
*Beattie.*

ENSUE', *v. a.* & *n.* Fr. *ensuivre;* Ital. *seguire*, from Lat. *sequor*. To follow; pursue; as a neuter verb, to succeed in consequence, or course of time.

Flee evil and do good; seek peace, and *ensue* it.
*Common Prayer.*

Then do no further goe, no further stray,
But here ly downe, and to thy rest betake,
The ill to prevent, that life *ensewen* may.
*Spenser. Faerie Queene.*

Let this be granted, and it shall hereupon plainly *ensue*, that the light of scripture once shining in the world, all other light of nature is therewith in such sort drowned, that now we need it not. *Hooker.*

The man was noble;
But with his last attempt he wiped it out,
Destroyed his country, and his name remains
To the *ensuing* age abhorred. *Shakspeare.*

Bishops are placed by collation of the king, without any precedent election or confirmation *ensuing*.
*Hayward.*

But now these Epicures begin to smile,
And say, my doctrine is more safe than true;
And that I fondly do myself beguile,
While these received opinions I *ensue*. *Davies.*
Of worse deeds worse sufferings must *ensue*.
*Milton.*

With mortal heat each other shall pursue;
What wars, what wounds, what slaughter shall *ensue!*
*Dryden.*

Impute not then those ills which may *ensue*
To me, but those who with incessant hate
Pursue my life. *Rowe's Ambitious Stepmother.*

Then grave Clarissa graceful waved her fan;
Silence *ensued*, and thus the nymph began. *Pope.*

Self-knowledge is the subject of the *ensuing* Treatise.—A subject, which the more I think of, the more important and extensive it appears. *Mason.*

ENSURE', *v. a.*
ENSU'RANCE, *n. s.*
ENSU'RANCER,
ENSU'RER,
From en and sure, q. v. also, and more commonly, written insure. To ascertain; make certain; secure against; exempt from hazard; bind by promise of marriage. Ensurance or ensurer are synonymous. See our article INSURANCE.

The vain *ensurancers* of life,
And they who most performed, and promised less,
Even Short and Hobbes, forsook the unequal strife.
*Dryden.*

A mendicant contracted with a country fellow for a quantity of corn, to *ensure* his sheep for that year.
*L'Estrange.*

It is easy to entail debts on succeeding ages, but how to *ensure* peace for any term of years is difficult enough. *Swift.*

Sense, mere, dull, formal Sense, in this gay town
Must have some vehicle to pass her down,
Nor can she for an hour *ensure* her reign,
Unless she brings fair Pleasure in her train.
*Churchill.*

Nor was the rigour of his mind to be softened but with the appearance of extraordinary fortitude in his enemies, which, by a sympathy congenial to his own virtues, always excited his admiration, and *ensured* his mercy. *Burke.*

ENT (Sir George), an eminent English physician, born at Sandwich, in Kent, in 1604. He was educated at Sidney College, Cambridge; and afterwards, travelling into foreign countries, received the degree of M. D. at Padua. After his return he obtained great practice, was made president of the college of physicians in London, and was at last knighted by Charles II. He was intimate with Dr. Harvey; whom he defended in a piece entitled, Apologia pro Circulatione Sanguinis, contra Æmilium Parisanum. He also published, Animadversiones in Thrustoni Diatribam; and some observations in the Philosophical Transactions. Glanville, speaking of the modern improvements in anatomy, ranks Sir George Ent with the most celebrated discoverers in that science. Sir George Ent died in October, 1680.

ENTA'BLATURE, *n. s.*
ENTA'BLEMENT, *n. s.*
From table. The architrave, frieze, and cornice of a pillar: see below.

Now these two knobs, or top ornaments of the mind of man, which crown the whole *entablature*—being, as I said, wit and judgment, which of all others, as I have proved it, are the most needful—the most prized—the most calamitous to be without, and consequently, the hardest to come at. *Sterne.*

ENTABLATURE, in architecture, is that part of an order of column which is over the capital, comprehending the architrave, frieze, and corniche. The word is formed of tabulatum or intabulamentum. The entablature is sometimes called the trabeation, and by Vitruvius and Vignola ornament. It is different in the different orders; indeed, it consists of the three grand parts or divisions above mentioned, in all; but those parts consist of a greater or less number of particular members or sub-divisions, as the orders are more or less rich. Vignola makes the entablature a quarter of the height of the whole column, in all the orders.

In the Tuscan and Doric, the architrave, frieze, and corniche, are all of the same height; in the Ionic, Corinthian, and Composite, the whole entablature being fifteen parts, five of them are allowed for the architrave, four for the frieze, and six for the corniche. See IONIC, CORINTHIAN, &c. and COLUMN.

**Entablature** or **Entablement**, is sometimes also used for the last row of stones on the top of the wall of a building, whereon the timber and covering rest. As this is frequently made to project beyond the line of the wall to carry off the rain, some authors call it in Latin stillicidium, or drip. Such an entablature does not stand out far enough; it lets the water fall on the foot of the wall.

ENTABLER, in the manege, the fault of a horse, whose croupe goes before his shoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping the right leg near, and removing the left leg as far from the horse's shoulders as possible. This is always accompanied with another fault called Aculer, which see.

ENTAIL, *v. a.*, *v. n.* & *n. s.* Fr. *entailler;* Ital. *intagliare*, from Fr. *tailler*, to cut. To settle an estate so that it must descend in a particular line; to fix inalienably: also, in an obsolete sense, to carve; and, as a verb neuter, to cut: as a substantive, it means the estate entailed, or rule of descent; likewise (obsolete) inlay; engraver's work.

Well it appeared to have been of old
A work of rich *entail*, and curious mold,
Woven with anticks and wild imagery.
*Faerie Queene.*

The mortal steel, dispiteously *entailed*,
Deep in their flesh, quite through the iron walls,
That a large purple stream adown their giambeaux falls.
*Id.*

I here *entail*
The crown to thee and to thine heirs for ever.
*Shakspeare.*

None ever had a privilege of infallibility *entailed* to all he said. *Digby on Bodies.*

The intemperate and unjust transmit their bodily infirmities and diseases to their children, and *entail* a secret curse upon their estates. *Tillotson.*

Had Richard unconstrained resigned the throne,
A king can give no more than is his own:
The title stood *entailed*, had Richard had a son.
*Dryden.*

When it shall appear that infallibility is *entailed* upon one set of men of any denomination, or truth confined to any spot of ground, the name and use of orthodoxy, as now it is in fashion every where, will in that one place be reasonable. *Locke.*

What! though a long patrician line ye claim,
Are noble souls *entailed* upon a name?
*Paul Whitehead.*

Not satisfied with having obtained a hereditary right to their fiefs, which they formerly held during pleasure, their ambition aimed at something bolder; and by introducing *entails*, endeavoured, as far as human ingenuity and invention can reach that end, to render their possessions unalienable and everlasting. *Robertson's Hist. of Scotland.*

ENTAME, *v. a.* From en and tame. To tame; to subjugate; to subdue.

'Tis not your inky brows, your black silk hair,
Your bugle eyeballs, and your cheek of cream,
That can *entame* my spirits to your worship.
*Shakspeare.*

ENTANGLE, *v. a.* } A word, according to Dr. Johnson,
Entanglement, *n. s.* } of uncertain etymology. Junius derives it from *tongs;* to tangle being, as he says, to hold with tongs: Skinner says from Goth. *tangl*, a twig. Mr. Todd deduces it from Goth. *tagl*, hair; and Mr. Thomson from *gindwingle*, to coil, from *wickle*, a fold. To enwrap, ensnare; hence to involve in difficulty or embarrassment; to distract.

The Pharisees took counsel how they might *entangle* him in his talk. *Matt.* xxii. 15.

No man that warreth *entangleth* himself with the affairs of this life. 2 *Tim.* ii. 4.

Now all labour
Marrs what it does, yea very force *entangles*
Itself with strength.
*Shakspeare. Antony and Cleopatra.*

The duke, being questioned, neither held silence as he might, nor constantly denied it, but *entangled* himself in his doubtful tale. *Hayward.*

He knew not how to wrestle with desperate contingencies, and so abhorred to be *entangled* in such. *Clarendon.*

The most improved spirits are frequently caught in the *entanglements* of a tenacious imagination.
*Glanville's Scepsis.*

I suppose a great part of the difficulties that perplex men's thoughts, and *entangle* their understandings, would be easily resolved. *Locke.*

It is to fence against the *entanglements* of equivocal words, and the arts of sophistry, that distinctions have been multiplied. *Id.*

There will be no greater *entanglements*, touching the notion of God and his providence. *More.*

Seek'st thou for hounds to climb the rocky steep,
And brush the *entangled* covert, whose nice scent
O'er greasy fallows and frequented roads,
Can pick the dubious way? *Somervile*

Laws are generally found to be nets of such a texture, as the little creep through, the great break through, and the middle-sized are alone *entangled* in.
*Shenstone.*

With what address the soft Ephesians draw
Their sable net-work o'er *entangled* hearts.
*Young.*

I cannot but lament thy splendid wit
*Entangled* in the cobwebs of the schools.
*Cowper.*

I with a smile would tell the *entangled* fair,
I envied even the vines a lodging there;
Then twist them off, and soothe with amorous play
Her breasts, and kiss each rosy mark away.
*Sheridan.*

ENTELECHIA, Εντελεχεια, of εντελεχης, perfect, a Greek term, which Aristotle uses in defining the soul; and which, as not occurring in any other author, has given the critics and philosophers great perplexity. See Soul. Hermolaus Barbarus is said to have consulted the devil about it; after which, in his paraphrase on Themestius, he renders it by perfectihabia! not a whit clearer. Cicero defines entelechia Tusc. Quest. lib. i. c. 1, to be, 'a certain, continued, and perpetual motion;' whence it would seem, that Aristotle took the soul for the mode of the body; a continuous motion being, doubtless, a mode of body.

The common Peripatetics hold entelechia to signify act, and under it suppose the form of the compound or animal to be understood. Others, i. e. the latest Peripatetics, agree, that the act, or entelechia, whereby Aristotle meant to explain the nature of the soul, is some mode of body or motion.

ENTEND, *v. a.* See Intend. To sketch or draw out; to mean or design.

Now wol I pray mekely every person discrete, that redeth or hereth this lityl tretise to have my rude *ententing* excused, and my superfluite of wordes, for two causes. *Astrolabie*, 1391.

I wol *entend* to winning if I may,
And not *entend* our things to declare,
For, brother min, thy wit is al to bare
To understand, although I told hem thee.
*Chaucer. Cant. Tales.*

ENTER, *v. a.* & *v. n.* EN'TERING, *n. s.* EN'TRANCE, EN'TRY. Fr. *entrer*; Span. and Port. *entrar*; It. *entrare*; Lat. *intrare*, i. e. *inter ire*, to go in, or enter within. To come or go into a place or institution: hence to introduce, or initiate into a business or design: as a neuter verb, to come or go in; to penetrate mentally; engage or be initiated in. An entry is a place of entrance.

That thing that *entrith* into the mouth defoulith not a man, but that thing that comith out of the mouth defoulith a man. *Wiclif. Matt.* 15.

Aftir the custom of the presthod, he went forth by lot and *entride* into the temple to encensen. *Id. Luk* 1.

But while he spak these thingis, a cloude was maad and ouerschadewide hem, and thei dredden whanne thei *entriden* into the cloude. *Id. Luk* 9.

It is laid waste, so that there is no house, no *entering* in. *Isaiah.*

He charged them to keep the passages of the hilly country; for by them there was an *entrance* into Judea. *Judith.*

Be not slothful to go and to *enter* to possess the land. *Judges.*

Each goodly thing is hardest to begin;
But *entred* in, a spacious court they see,
Both plaine and pleasaunt.
*Spenser. Faerie Queene.*

He nought was moved at their *entraunce* bold,
For of their coming woll he wist afore. *Id.*

Since we are so far *entered*, let us, I pray you, a little devise of those evils by which that country is held in this wretched case, that it cannot, as you say, be recured. *Spenser's Ireland.*

Whence are you, sir? Has the porter his eyes in his head, that he gives *entrance* to such companions? Pray, get you out. *Shakspeare.*

The reason, that I gather, he is mad,
Is a mad tale he told to-day at dinner,
Of his own door being shut against his *entrance*.
*Id.*

All the world's a stage,
And all the men and women merely players;
They have their exits and their *entrances*. *Id.*

They of Rome are *entered* in our counsels,
And know how we proceed. *Id. Coriolanus.*

Mr. Phang, have you *entered* the action?
—It is *entered*. *Id. Henry IV.*

He that travelleth a country before he hath some *entrance* into the language, goeth to school, and not to travel. *Bacon's Essays.*

Some there are that know the resorts and falls of business, that cannot sink into the main of it; like a house that hath convenient stairs and *entries*, but never a fair room. *Bacon.*

The day being come, he made his *entry*: he was a man of middle stature and age, and comely. *Id.*

Bathing and anointing give a relaxation or emollition; and the mixture of oil and water is better than either of them alone, because water entereth better into the pores, and oil after *entry* softeneth better. *Id. Natural History.*

From the first *entrance* of this king to his reign, never was king either more loving, or better beloved. *Hayward. Edward VI.*

Palladio did conclude, that the principal *entrance* was never to be regulated by any certain dimensions, but by the dignity of the master. *Wotton.*

St. Augustine, in the *entrance* of one of his sermons, makes a kind of apology. *Hakewill on Providence.*

The earl of Holland we have had occasion to mention before in the first *entrance* upon this discourse.

Thought following thought, and step by step led on,
He *entered* now the bordering desert wild,
And with dark shades and rocks environed round,
His holy meditation thus pursued. *Milton.*

Other creature here,
Beast, bird, insect, or worm, durst *enter* none.
*Id.*

O pity and shame, that those who to live well
*Entered* so fair, should turn aside! *Id.*

Many are the ways that lead
To his grim cave, all dismal! yet to sense
More terrible at the *entrance* than within. *Id.*

Agues and fevers are *entered* promiscuously, yet in the few bills they have been distinguished. *Graunt.*

Though selfishness hath defiled the whole man, yet sensual pleasure is the chief part of its interest, and therefore, by the senses it commonly works, and these are the doors and the windows by which iniquity *entereth* into the soul. *Baxter.*

A straight long *entry* to the temple led,
Blind with high walls, and horror over head.
*Dryden.*

Let this, and every other anxious thought,
At the *entrance* of my threshold be forgot. *Id.*

This is that which, at first *entrance*, baulks and cools them: they want their liberty. *Locke.*

The eldest being thus *entered*, and then made the fashion, it would be impossible to hinder them. *Id.*

Where diligence opens the door of the understanding, and impartially keeps it, truth is sure to find both an *entrance* and a welcome too. *South.*

Gentlemen did not care to *enter* into business 'till after their morning draught. *Tatler.*

We proceeded through the *entry*, and were necessarily kept in order by the situation. *Id.*

The French king hath often *entered* on several expensive projects, on purpose to dissipate wealth. *Addison on the War.*

As soon as they once *entered* into a taste of pleasure, politeness, and magnificence, they fell into a thousand violences, conspiracies, and division. *Addison.*

Andrew Doria has a statue erected to him at the *entrance* of the doge's palace, with the glorious title of deliverer of the commonwealth. *Id.*

The lake of Constance is formed by the *entry* of the Rhine. *Id.*

He is particularly pleased with Livy for his manner of telling a story, and with Sallust for his *entering* into eternal principles of action. *Id.*

By the *entry* of the chyle and air into the blood, by the lacteals, the animal may again revive. *Arbuthnot on Aliments.*

A king of repute and learning *entered* the lists against him. *Atterbury.*

They were not capable of *entering* into the numerous concurring springs of action. *Watts.*

And there he lay, full length, where he was flung,
Before the *entrance* of a cliff-worn cave,
With just enough of life to feel its pain,
And deemed that it was saved, perhaps, in vain.
*Byron.*

ENTERDE'AL, *n. s.* From *entre* and deal. Reciprocal transactions. Obsolete.

For he is practised well in policy,
And thereto doth his courting most apply;
To learn the *enterdeal* of princes strange,
To mark the intent of counsels, and the change
Of states. *Hubberd's Tale.*

ENTERITIS, from εντερον, the intestine. Inflammation of the intestines. It is a genus of disease in the class pyrexiæ, and order phleghmasiæ of Cullen, being known by the presence of pyrexia, a fixed pain in the abdomen, costiveness, and vomiting This disease is principally occasioned by acrid substances, indurated fæces, long-continued and obstinate costiveness, spasmodic colic, and a strangulation of any part of the intestinal canal; but another very general cause is the application of cold to the lower extremities, or to the belly itself. It is a disease which is most apt to occur at an advanced period of life, and is very liable to a relapse. Dr. Gregory has remarked, that a purgative medicine has often been known to operate as soon as a blister, applied to the belly, began to rise, which had not acted previously: and this observation is still more commonly verified, after a free evacuation by blood-letting. See Edinburgh Medical and Surgical Journal, vol. i. p. 64. Some practitioners have attempted to open a passage for the fæces, by mechanically distending the large intestines, by throwing up five, six, or seven pints of warm water with an injecting syringe. This expedient may be useful in spasmodic colic; but it is objectionable, in enteritis, on several grounds. Such distension can only be accomplished in the colon, or great gut; whereas the obstruction by inflammation is commonly in some portion of the small intestines, and therefore out of the reach of the enema. In the next place, any forcible distension of an inflamed and thickened canal, if it could be accomplished, would rather conduce to an increase of the inflammatory condition, then to lessen it by the removal of fæces. In a word, all measures applied to the inflamed intestine should be mild; since forcible ones cannot but augment the inflammation, upon which the impeded function of the organ depends. By way of clyster, therefore, a little common salt, magnesia vitriolated, or infusion of senna, with gruel or warm water, will probably answer every good purpose that can be expected from such an expedient. Tobacco smoke has been often injected, when milder means have failed, or infusions of tobacco; but their success, we believe, has not often been experienced. Indeed, tobacco injections are liable to produce great sickness and irritation, if that herb be not used in very small quantities. The extreme sickness which often accompanies enteritis, and by which every thing that is taken into the stomach, whether liquid or solid, is rejected, renders it difficult, in some cases, to produce any effect upon the bowels by internal medicine. In this case, the irritability of the stomach may be quieted by the saline effervescing draught, or by a small opium pill, or, if this be rejected, by an opiate given in a clyster; after which, the necessary laxative medicines may be retained, and accomplish the intended object. It should be observed, however, that the stimulus of opium will prove rather injurious than useful, while the inflammation is unsubdued. See MEDICINE.

Where the inflammation has risen from strangulated hernia, the operation, by which the strangulation is removed, and the intestine returned into its place, can alone save the life of the patient. See HERNIA.

ENTERLA'CE, *v. a.* Fr. *entrelasser.* To intermix; to interweave. See LACE.

This lady walked outright, 'till she might see her enter into a fine close arbor: it was of trees, whose branches so lovingly *enterlaced* one another, that it could resist the strongest violence of the sight. *Sidney.*

ENTERO'CELE, *n. s.* Lat. *enterocele.* A rupture from the bowels pressing through or dilating the peritonæum, so as to fall down into the groin. The remedy in such cases, is chiefly by trusses and bolsters.

If the intestine only is fallen, it becomes an *enterocele*; if the omentum or epiploon, epiplocele; and if both, enteroepiplocele. *Sharp's Surgery.*

ENTERO'LOGY, *n. s.* Ἔντερον and λόγος. The anatomical account of the bowels and internal parts.

ENTERO'MPHALOS, *n. s.* Ἔντερον and ὀμφαλος. An umbilical or naval rupture.

ENTERPA'RLANCE, *n. s.* Fr. *entre* and *parler.* Parley; mutual talk; conference.

During the *enterparlance* the Scots discharged against the English, not without breach of the laws of the field. *Hayward.*

ENTERPLE'ADER, *n. s.* *Entre* and plead. The discussing of a point incidentally falling out, before the principal cause can proceed. For example: two several persons, being found heirs to land by two several officers in one county, the king is brought in doubt whether livery ought to be made; and therefore, before livery be made to either, they must enterplead; that is, try between themselves who is the right heir.

ENTERPRIZE, *n. s.* & *v. a.* } Fr. *entreprize*, *entreprendre*,
ENTERPRIZER, *n. s.* } from Lat. *prehendere*, to seize or take hold. An undertaking involving some degree of boldness or hazard: to attempt an essay or business of this kind, the verb being derived from the noun.

Now is the time to execute mine *enterprises* to the destruction of the enemies. *Judith* ii. 5.

In goodly garments, that her well became,
Fair marching forth in honourable wise,
Him at the threshold met, and well did *enterprise*. *Spenser.*

Whet on Warwick to this *enterprise*. *Shakspeare.*

They commonly proved great *enterprisers* with happy success. *Hayward on Edward VI.*

Unanimous they all commit the care
And management of this main *enterprise*
To him their great dictator. *Milton.*

Nor shall I to the work thou *enterprisest*
Be wanting, but afford thee equal aid. *Id.*

The day approached, when fortune should decide
The important *enterprise*, and give the bride. *Dryden.*

An epick poem, or the heroick action of some great commander, *enterprised* for the common good and

honour of the Christian cause, and executed happily, may be as well written now, as it was of old by the heathens. *Id.*

Princes were only chiefs of those assemblies, by whose consultations and authority the great actions were resolved and *enterprised.* *Temple.*

Vanity and resentment were the great springs of all his undertakings, and his neighbours easily found the way, by touching these, to force him upon many rash and inconsistent *enterprises.*
*Robertson's History of Scotland.*

Is he confident, bold, and *enterprising?* Ambition appears to be the secret spring. *Mason.*

A world is up in arms, and thou a spot
Not quickly found, if negligently sought,
Thy soul as ample as thy bounds are small,
Endurest the brunt, and darest defy them all:
And wilt thou join to this bold *enterprise*
A bolder still, a contest with the skies?
*Cowper.*

She knows not, says he, of this *enterprise:* and I go without bidding her farewell: for I call the gods to witness, that I cannot support the sight of a weeping mother. *Beattie.*

ENTERTA'IN, *v. a* } Fr. Span. and
ENTERTA'INER, *n. s.* } Port. *entretenir;*
ENTERTA'INMENT, *n. s.* } Ital. *intratenere,*
from Lat. *intra*, within (as in a house), and *tenere*, to detain. To receive hospitably; treat; converse with; deal with as a guest: hence to receive and reserve in the mind, with pleasure or otherwise; to amuse, divert.

Be not forgetful to *entertain* strangers; for thereby some have *entertained* angels unawares. *Heb.* xiii. 2.

Arrived there, the little house they fill,
Ne look for *entertainment* where none was;
Rest is their feast, and all things at their will;
The noblest mind the best contentment has.
*Faerie Queene.*

How many men would you require to the furnishing of this which you take in hand? And how long space would you have them *entertained?*
*Spenser's Ireland.*

Heaven, set ope thy everlasting gates,
To *entertain* my vows of thanks and praise.
*Shakspeare.*

You, Sir, I *entertain* for one of my hundred; only I do not like the fashion of your garments.
*Id. King Lear.*

I'll weep and sigh,
And, leaving so his service, follow you,
So please you *entertain* me. *Id. Cymbeline.*

Have you an army ready, say you?
——A most royal one. The centurions and their charges distinctly billeted, already in the *entertainment*, and to be on foot at an hour's warning.
*Id. Coriolanus.*

Because all men are apt to flatter themselves, to *entertain* the additions of other men's praises is most perilous. *Raleigh.*

He was, in his nature and constitution of mind, not very apprehensive or forecasting of future events afar off, but an *entertainer* of fortune by the day.
*Bacon's Henry VII.*

Because he that knoweth least is fittest to ask questions, it is more reason, for the *entertainment* of the time, that he ask me questions than that I ask you.
*Id. New Atlantis.*

The captains did covenant with the king to serve him with certain numbers of men, for certain wages and *entertainment.* *Davies.*

The first *entertainment* of this message would make a stranger think Balaam wise and honest.
*Bp. Hall's Contemplations.*

With British bounty in his ship he feasts
The Hesperian princes, his amazed guests,
To find that watery wilderness exceed
The *entertainment* of their great Madrid.
*Waller.*

It is not easy to imagine how it should at first gain *entertainment*, but much more difficult to conceive how it should be universally propagated.
*Tillotson.*

Passions ought to be our servants, and not our masters; to give us some agitation for *entertainment*, but never to throw reason out of its seat. *Temple.*

Many who pretend to be wise by the forms of being grave, are apt to despise both poetry and music, as toys and trifles too light for the use or *entertainment* of serious men. *Sir W. Temple.*

Reason can never permit the mind to *entertain* probability in opposition to knowledge and certainty.
*Locke.*

His head was so well stored a magazine, that nothing could be proposed which he was not readily furnished to *entertain* any one in. *Id.*

You shall find an apartment fitted up for you, and shall be every day *entertained* with beef or mutton of my own feeding. *Addison.*

They were capable of *entertaining* themselves on a thousand subjects, without running into the common topicks. *Id.*

A great number of dramatick *entertainments* are not comedies, but five-act farces. *Gay.*

He shows both to the guests and to the *entertainer* their great mistake. *Smalridge.*

It is little the sign of a wise or good man to suffer temperance to be transgressed, in order to purchase the repute of a generous *entertainer.* *Atterbury.*

The history of the Royal Society shows how well philosophy becometh a narration: the progress of knowledge is as *entertaining* as that of arms.
*Felton on the Classicks.*

This purpose God can *entertain* towards us.
*Decay of Piety.*

David *entertained* himself with the meditations of God's law, not his hidden decrees or counsels. *Id.*

In gardens, art can only reduce the beauties of nature to a figure which the common eye may better take in, and is therefore more *entertained* with.
*Pope's Preface to the Iliads.*

He was always careful of his money, and was therefore no liberal *entertainer*; but was less frugal of his wine than of his meat. *Johnson's Life of Swift.*

I returned, somewhat astonished, to the ship, but still without *entertaining* the slightest suspicion.
*Franklin.*

SIR BENJ. Yet no man lives in greater splendour. They tell me, when he *entertains* his friends, he will sit down to dinner with a dozen of his own securities; have a score of tradesmen waiting in the anti-chamber, and an officer behind every guest's chair.

J. SURF. This may be *entertainment* to you, gentlemen, but you pay very little regard to the feelings of a brother. *Sheridan.*

ENTERTI'SSUED, *adj.* *Entre* and tissue. Enterwoven or intermixed with various colors or substances.

The sword, the mace, the crown imperial,
The *entertissued* robe of gold and pearl.
*Shakspeare.*

ENTHRA'LL, *v. a.* From en and THRALL, which see. See INTHRALL. To enslave; shackle

Books are not seldom talismans and spells,
By which the magic art of shrewder wits
Hold an unthinking multitude *enthralled*. *Cowper*.

ENTHRONE', *v. a.* } From en and
ENTHRONIZA'TION, *n. s.* } throne. To place on a throne or regal chair; to invest with sovereign authority.

Mercy is above this sceptered sway;
It is *enthroned* in the hearts of kings;
It is an attribute to God himself. *Shakspeare*.

On a tribunal silvered,
Cleopatra and himself, in chairs of gold,
Were publicly *enthroned*. *Id.*

Not a few, in these latter times, have been raised to such a confidence of the speedy accomplishment of this new Kingdom, as if they did already see the clouds breaking under the glorious feet of their returning Saviour, and the chairs of this blessed state set ready for their *enthronizatian*. *Bp. Hall.*

This pope was no sooner elected and *enthroned*, but that he began to exercise his new rapines.
*Ayliffe's Parergon.*

Beneath a sculptured arch he sits *enthroned*,
The peers, encircling, form an awful round.
*Pope.*

So sits *enthroned* in vegetable pride
Imperial Kew by Thames's glittering side;
Obedient sails from realms unfurrowed bring
For her the unnamed progeny of spring.
*Darwin.*

ENTHU'SIASM, *n. s.* } Fr. *enthusiasme*;
ENTHU'SIAST, } Span. and Ital. *entusiasmo*; Gr. ενθουσιασμος, from εν in,
ENTHUSIAS'TIC, *adj.* }
ENTHUSIAS'TICAL, }
and θεος God. Belief of being divinely inspired or influenced; confidence or warmth of opinion. See below.

He pretended not to any seraphick *enthusiastical* raptures, or inimitable unaccountable transports of devotion. *Calamy.*

Imaging is, in itself, the very height and life of poetry, which, by a kind of *enthusiasm*, or extraordinary emotion of soul, makes it seem to us that we behold those things which the poet paints. *Dryden.*

At last divine Cecilia came,
Inventress of the vocal frame;
The sweet *enthusiast*, from her sacred store,
Enlarged the former narrow bounds,
And added length to solemn sounds,
With nature's mother-wit, and arts unknown before.
*Id.*

*Enthusiasm* is founded neither on reason nor divine revelation, but rises from the conceits of a warmed or overweening brain. *Locke.*

An *enthusiastick* or prophetick style, by reason of the eagerness of the fancy, doth not always follow the even thread of discourse. *Burnet.*

An *enthusiast* in religion stumbles at the ordinary occurrences of life, if he cannot quote Scripture examples on the occasion. *Steele.*

Chapman seems to have been of an arrogant turn, and an *enthusiast* in poetry.
*Pope's Preface to the Iliad.*

The same *enthusiasm*, that dignifies a butterfly or a medal to the virtuoso and the antiquary, may convert controversy into quixotism. *Percival.*

At last, sublimed
To rapture and *enthusiastick* heat,
We feel the present Deity. *Thomson.*

*Enthusiasm* is a beneficent enchantress, who never exerts her magic but to our advantage, and only deals about her friendly spells, in order to raise imaginary beauties, or to improve real ones. *Fitzosborne.*

He still retained a portion of his former *enthusiasm*; and, being fond of argument, we frequently disputed together. *Franklin.*

His mind was fraught with independence, magnanimity, and every manly virtue. I loved and admired him to a degree of *enthusiasm*, and of course strove to imitate him. *Burns.*

I was a good deal noted for a retentive memory, a stubborn sturdy something in my disposition, and an *enthusiastic* idiot piety. *Id.*

No man, who is not inflamed by vain glory into *enthusiasm*, can flatter himself that his single, unsupported, desultory, unsystematic endeavours are of power to defeat the subtle designs and united cabals of ambitious citizens. *Burke.*

Religion is among the most powerful causes of *enthusiasm*. *Id.*

Ye devotees to your adored employ,
*Enthusiasts*, drunk with an unreal joy,
Love makes the music of the blessed above,
Heaven's harmony is universal love. *Cowper.*

And still the stage by mimic art displays
Historic pantomine in modern days;
And hence the *enthusiast* orator affords
Force to the feebler eloquence of words. *Darwin.*

But she, who set on fire his infant heart,
And all his dreams, and all his wanderings shared
And blessed, the Muse, and her celestial art,
Still claim the *enthusiast's* fond and first regard.
*Beattie.*

ENTHUSIASM, Ενθουσιασμος, a poetic or prophetic rage or fury, which transports the mind, inflames and raises the imagination, and makes it conceive and express things extraordinary and surprising.

The word is derived from the Greek ενθεος, or ενθους, a man animated in an extraordinary manner with the Spirit of God; in whom God is, or whom he animates. Whence the verb ενθουσιαζω, or ενθουσιαω, and the noun ενθουσιασμος, enthusiasm, and ενθουσιαστης, enthusiast, a person subject to such transports.

Enthusiasm is more particularly defined by M. de Piles to be a transport of the mind, by which it is led to think and imagine things in a sublime, surprising, yet probable manner. The sublime he thinks a necessary ingredient in the definition, as being the proper effect and production of enthusiasm.

This is the enthusiasm felt in poetry, oratory, music, painting, sculpture, &c. (see the next article); but the enthusiasm which belongs to works of art is very different from that attributed to the sibyls and priestesses of the oracles, and heathen gods, which was little else but fanaticism and consisted principally in grimace, and contortions of the body.

Mr. Locke with his usual acumen observes that there is a degree of assent which, with some men, has the same authority as either faith or reason; and that is enthusiasm which, laying by reason, would set up revelation without it; whereby, in effect, it takes away both reason and revelation, and substitutes in the room of it the ungrounded fancies of a man's own brain, and assumes them for a foundation, both of opinion and conduct. Immediate revelation being a much easier way for men to establish their opinions, and regulate their conduct by, than the tedious labor of strict reasoning, it is no wonder that some have been very apt to pretend to it:

especially in such of their actions and opinions as they cannot account for by the ordinary methods of knowledge and principles of reason. Hence we see that in all ages men in whom melancholy has mixed with devotion, or whose conceit of themselves has raised them into an opinion of a greater familiarity with God than is allowed others, have often flattered themselves with the persuasion of an immediate intercourse with the Deity, and frequent communications with the Divine Spirit. The mind being thus prepared, whatever groundless opinion comes to settle itself strongly upon the fancy, is an illumination from the Spirit of God; and, whatsoever odd action such persons find in themselves an inclination to do, that impulse is concluded to be a call or direction from heaven, and must be obeyed.

'This,' says he, 'I take to be properly enthusiasm; which, though rising from the conceit of a warm and over-weening brain, works, where it once gets footing, more powerfully on the persuasions and actions of men than either reason or revelation, or both together; men being most forwardly obedient to the impulses they receive from themselves. When men are once got into this way of immediate revelation, of illumination without search, and certainty without proof, reason is lost upon them; they are above it; they see the light infused into their understanding, and they cannot be mistaken: like the light of bright sunshine, it shows itself, and needs no other proof but its own evidence; they feel the hand of God moving them within, and the impulses of the spirit, and cannot be mistaken in what they feel But, of this seeming and feeling, it is a perception of an inclination to do something, or of the Spirit of God moving that inclination: these are two very different perceptions, and should be carefully distinguished.' Essay on the Understanding, book iv.

Enthusiasm is defined by Dr. Hartley (Obs. on Man) to be a mistaken persuasion in any person that he is a peculiar favorite with God; and that he receives supernatural marks thereof. The vividness of the ideas of this class easily generates this false persuasion in persons of strong fancies, little experience in divine things, and narrow understandings (and especially where the moral sense, and the scrupulosity attending its growth and improvement, are but imperfectly formed), by giving a reality and certainty to all the reveries of a man's own mind, and cementing the associations in a preternatural manner. It may also be easily contracted by contagion, as daily experience shows; and indeed more easily than most other dispositions, from the glaring language used by enthusiasts, and from the great flattery and support which enthusiasm affords to pride and self-conceit. 'The ingredients,' says lord Lyttleton, in his Observations on the Conversion, &c., of St. Paul, 'of which enthusiasm is generally composed are, great heat of temper, melancholy, ignorance, credulity, and vanity or self-conceit.'

Hume makes some just reflections on the different influences of enthusiasm and superstition, on government and society. 'The true sources of enthusiasm,' he observes, 'are hope, pride, presumption, a warm imagination, together with ignorance. Superstition is favorable to priestly power, and enthusiasm not less, or rather more, contrary to it than sound reason and philosophy. Secondly, Religions which partake of enthusiasm are, on their first rise, more furious and violent than those which partake of superstition; but in a little time become more gentle and moderate. When enthusiasm rises to that height as to inspire the deluded fanatic with the opinion of divine illuminations, and with a contempt for the common rules of reason, morality, and prudence, it produces the most cruel disorders in human society; but its fury is like that of thunder and tempest, which exhaust themselves in a little time, and leave the air more calm and serene than it was before. When the first fire of enthusiasm is spent, men naturally, in all fanatical sects, sink into the greatest remissness and coolness in sacred matters; there being no body of men among them, endowed with sufficient authority, whose interest is concerned to support the religious spirit: no rites, no ceremonies, no holy observances, which may enter into the common train of life, and preserve the sacred principles from oblivion.' He observes, thirdly, 'that superstition is an enemy to civil liberty, and enthusiasm a friend to it.'

ENTHYMEME, *n. s.* Ενθυμημα. An argument consisting only of an antecedent and consequential proposition; a syllogism where the major proposition is suppressed, and only the minor and consequence produced in words.

Playing much upon the simple or lustrative argumentation, to induce their *enthymemes* unto the people, they take up popular conceits. *Browne.*

What is an *enthymeme,* quoth Cornelius? Why, an *enthymeme,* replied Crambe, is when the major is indeed married to the minor, but the marriage kept secret. *Arbuthnot and Pope.*

ENTHYMEME, in logic and rhetoric, an argument consisting of two propositions, an antecedent and a consequent deduced from it. The word is formed of the verb ενθυμεισθαι, to think or conceive, a compound of εν and θυμος, mind.

Aristotle calls it the rhetorical or probable argument; the schools, the imperfect syllogism, in contradistinction from the perfect, which consists of three propositions, and is called the dialectical argument. It must be observed, however, that the enthymeme is really a perfect syllogism in the mind, and only imperfect in the expression, because one of these premises is suppressed, as being sufficiently clear and obvious, and easily supplied by the understanding of those with whom we discourse.

Thus, in every right-lined triangle, the three angles are equal to two right ones; that, consequently, they are so in an isosceles triangle, is an enthymeme; the proposition, that an isosceles triangle is a right-lined triangle, being omitted, as being sufficiently known and granted. The enthymeme is said to be the most simple and elegant of all argumentations; being what a man, in arguing closely, commonly makes, without attending at all to the form. Thus, that verse remaining of Ovid's tragedy, entitled Medea, contains an enthymeme: 'Servare potui, perdere

an possum rogas:' 'I was able to save you; consequently to have destroyed you.' All the beauty would have been lost had all the propositions been expressed; the mind is displeased with the rehearsal of what is no ways necessary. Sometimes, also, the two propositions of an enthymeme are both included in a single proposition, which Aristotle calls an enthymematical sentence, and gives this instance of it: 'Mortal, do not bear an immortal hatred.' The whole enthymeme would be, 'Thou art mortal; let not, therefore, thy hatred be immortal.'

ENTICE, *v. a.*, ENTICE'MENT, *n. s.*, ENTICE'R, ENTICE'INGLY, *adv.* Old. Fr. *enticer;* Goth. *tegia;* Swed. *tagia;* Ang.-Sax. teogan, or tiletan, probably from Lat. *tego;* Gr. *στιγω*, to hide; dissemble. To beguile; allure; attract (generally) to evil: enticement is the act, practice, or means of enticing: enticer, he who practises enticement.

If a man *entice* a maid that is not betrothed, he shall surely endow her to be his wife. *Exodus* xxii. 16.

The readiest way to entangle the mind with false doctrine, is first to *entice* the will to wanton living. *Ascham's Schoolmaster.*

Suppose we that the sacred word of God can at their hands receive due honour, by whose *enticement* the holy ordinances of the church endure every where open contempt? *Hooker.*

He (the poet) doth not only shew the way, but giveth so sweet a prospect into the way, as will *entice* any man to enter into it. *Sir P. Sidney.*

In all these instances we must separate intreaty and *enticements* from deceit or violence. *Taylor.*

The bee with honied thigh,
That at her flowery work doth sing,
And the waters murmuring,
With such consort as they keep,
*Entice* the dewy feathered sleep. *Milton.*
And here to every thirsty wanderer,
By sly *enticement* gives his baneful cup,
With many murmurs mixt. *Id.*
So sang the syrens, with enchanting sound,
*Enticing* all to listen, and be drowned. *Glanville.*
She strikes a lute well, and sings most *enticingly.* *Addison.*

ENTICK (John), M. A., a miscellaneous compiler, was born in 1713. At the age of eighteen he engaged in a controversy with Woolston, against whom he wrote The Evidence of Christianity proved from Facts, which is mainly a translation from Houteville. He was subsequently a schoolmaster near London; and wrote for the booksellers a Naval War, a History of the Seven years' War, an enlarged edition of Maitland's History of London, &c. &c. In the last of these works is a history of Wilkes's proceedings with the city of London, Entick being one of his party. He also compiled a Latin and English Dictionary, and an English Spelling Dictionary, of which great numbers were for some years sold. He had also a share in composing the new Week's Preparation, and the Whole Duty of Man. He died in 1773.

ENTIER, in the manege, is used for a sort of resty horse that refuses to turn, and is so far from following or observing the hand that he resists it. If your horse is entier, and refuses to turn to what hand you will, provided he flies, or parts from the heels, you have a remedy, by putting the Newcastle on him; that is, a cavesson made after the duke of Newcastle's way. The word is French, and is also used among them to denote a stone-horse.

This term, in its common acceptation, is applied to a horse that refuses to turn, and whose refusal proceeds from the awkwardness and stiffness of the body and limbs, and sometimes from malice and bad habits. In some cases a hurt in his foot, leg, or shoulder, may be the cause of his refusing to turn to that side where he feels any pain. A hurt in his reins or haunches, a curb or spaving, which, by hindering him to bend and rest upon his hocks, may make him guilty of this disobedience. These are evils which art can do little towards curing. The term entier, in its figurative sense, in which it is always to be understood in horsemanship, means a stiff horse, or one that is not suppled, and therefore refuses to turn, from the pain and difficulty which he finds in putting himself into a proper posture. Accordingly the Italians, from whom the terms of horsemanship are chiefly taken and adopted, or naturalised, by other nations, figuratively call a stiff and undisciplined horse a whole, entire, or unbroken horse.

ENTIRE, *adj.*, ENTIRE'LY, *adv.*, ENTIRE'NESS, *n. s.*, ENTIRE'TY, *n. s.* Fr. *entier;* Span. *entiro;* Ital. *intero* or *integro;* Lat. *integer, integra*, from *in*, not, and *tango*, anciently *tago*, Gr. *θιγω*, to touch. Untouched; unbroken; whole; full; complete: hence metaphorically, honest; firm; faithful; impartial; and, in an obsolete sense, inward. Entireness and entirety mean completeness; the whole: also honesty, firmness, and intimacy of friendship.

Then back to fight again, new breathed and *entire.* *Spenser.*

Which when his pensive lady saw from far,
Great woe and sorrow did her soul assay,
As weening that the sad end of the war,
And 'gan to highest God *entirely* pray. *Faerie Queene.*

The church of Rome hath rightly considered that public prayer is a duty *entire* in itself, a duty requisite to be performed much oftener than sermons can be made. *Hooker.*

Love 's not love,
When it is mingled with regards that stand
Aloof from the *entire* point. *Shakspeare. King Lear.*

Euphrates, running, sinketh partly into the lakes of Chaldea, and falls not *entirely* into the Persian sea. *Raleigh.*

He run a course more *entire* with the king of Arragon, but more laboured and officious with the king of Castile. *Bacon.*

It is not safe to divide, but to extol the *entire*, still in general. *Id. Collection of Good and Evil.*

Sometime the attorney thrusteth into the writ the uttermost quantity; or, else setteth down an *entirety*, where but a moiety was to be passed. *Bacon.*

*Entireness* with wicked consorts is one of the strongest chains of hell, and binds us to a participation both of sin and punishment. *Bp. Hall's Contemplations.*

No man had ever a heart more *entire* to the king, the church, or his country; but he never studied the easiest way to those ends. *Clarendon.*

Wrath shall be no more
Thenceforth, but in thy presence joy *entire*.
*Milton.*

Here finished he, and all that he had made
Viewed, and beheld! all was *entirely* good. *Id.*

In an arch, each single stone, which, if severed from the rest, would be perhaps defenceless, is sufficiently secured by the solidity and *entireness* of the whole fabrick, of which it is a part. *Boyle.*

An action is *entire* when it is complete in all its parts, or, as Aristotle describes it, when it consists of a beginning, a middle, and an end. *Spectator.*

An antique model of the famous Laocoon is *entire* in those parts where the statue is maimed.
*Addison on Italy.*

*Entire* and sure the monarch's rule must prove,
Who founds her greatness on her subjects' love.
*Prior.*

Water and earth, composed of old worn particles and fragments of particles, would not be of the same nature and texture now with water and earth composed of *entire* particles in the beginning. *Newton.*

Chyle may be said to be a vegetable juice in the stomach and intestines; as it passeth into the lacteals it grows still more animal, and when it has circulated often with the blood, it is *entirely* so.
*Arbuthnot.*

General consent *entirely* altered the whole frame of their government. *Swift.*

The more *entirely* the inferior creation is submitted to our power, the more answerable we should seem for our mismanagement of it. *Pope.*

This is the natural consequence of the union and *entirety* of their interest. *Blackstone.*

The ministers of earthly princes too often do this; and it would be happy if all the ministers and ambassadors of the heavenly King were *entirely* clear of the imputation. *Mason.*

ENTITLE, *v. a.* Fr. *entituler*, from en and title. To give title or discriminating appellation to; to inscribe or superscribe; to give a claim to: and hence to grant a thing as claimed by title, or right.

Besides the Scripture, the books which they call ecclesiastical were thought not unworthy to be brought into publick audience, and with that name they *entitled* the books which we term Apocryphal.
*Hooker.*

Next favourable thou,
Who highly thus to *entitle* me vouchsafest
Far other name deserving!
*Milton's Paradise Lost.*

But we, descended from your sacred line,
*Entitled* to your heaven, and rites divine,
Are banished earth. *Dryden's Virgil.*

This is to *entitle* God's care how and to what we please. *Locke.*

How ready zeal for party is to *entitle* Christianity to their designs, and to charge atheism on those who will not submit. *Id.*

God discovers the martyr and confessor without the trial of flames and tortures, and will hereafter *entitle* many to the rewards of actions which they had never the opportunity of performing. *Addison.*

He *entitled* himself to the continuance of the divine protection and goodness, by humiliation and prayer.
*Atterbury.*

We have been *entitled*, and have had our names affixed at length to whole volumes of mean productions. *Swift.*

Hardly even is the penitent sinner saved; thus difficult is that duty, by which alone he can be reconciled to his Creator, and *entitled* to the mercies of the gospel. *Rogers.*

ENTITY. See Ens.

ENTOIL, *v. a.* From en and toil. To ensnare; to entangle; to bring into toils or nets.

He cut off their land forces from their ships, and *entoiled* both their navy and their camp with a greater power than theirs, both by sea and land. *Bacon.*

ENTOMB, *v. a.* From en and tomb. To put into a tomb; to bury.

Processions were first begun for the interring of holy martyrs, and the visiting of those places where they were *entombed*. *Hooker.*

The cry went once for thee, and yet it may again,
If thou wouldst not *entomb* thyself alive,
And case thy reputation in a tent. *Shakspeare.*

They within the beast's vast womb,
The choice and flower of all their troops *entomb*.
*Denham.*

We know where things and men must end at last,
A moral (like all morals), melancholy,
And 'Et sepulchri immemor struis domos'
Shows that we build when we should but *entomb* us.
*Byron.*

# ENTOMOLOGY.

ENTOMOLOGY (*εντομον*, an insect, i.e. an animal *cut into*, from *εν* in, and *τεμνω* to cut; and *λογος*, a discourse), that branch of the science of zoology which treats of insects. These animals clearly derive both their Greek and Latin name (insecta), and thence our English name, insects, from the many segments or joints that appear in their different bodies, a peculiarity which led the older naturalists to class them with, vermes, crustacea, and other subdivisions of the animal kingdom. whose more important characteristics have induced most naturalists of modern times to treat them distinctly. Some of the Oriental languages gave their name to these tribes from an equally obvious distinction, i.e. their feet and motions: hence the Hebrew רמש, a creeping or crawling animal, a designation revived in the modern myriapoda class. The illustrious Linné's definition of insects, indeed, is oriental in its first and most accurate clause. Animalcula polypoda, spiraculis lateralibus respirantia, cute ossea cataphracta; antennis mobilibus sensoriis instruuntur Syst. Nat. ed xii. '*Polypod* animalcula, breathing by lateral spiracles, armed throughout with an osseous skin, and whose heads are furnished with moveable sensitive antennæ.'

The character of insection, however, as distinguishing this part of animal nature, has been more familiar to us in the west: it meets the eye on a moment's inspection of the wasp, the bee, or the fly; and is more or less present through all the genera. Pliny adopted it from Aristotle, including amongst these animals, on account of this characteristic, even the apods, which the Greek philosopher had expressly distinguished

from them, and these writers were followed in this respect by every succeeding author until the appearance of the great Swedish naturalist.

Insects form unquestionably the most numerous class of animals. Of their interest and importance as a study the reader will judge far more in accordance with his own previous habits and pursuits than from any thing we can state of their's. 'In his tam parvis tamque ferè nullis quæ ratio! Quanta vis! Quam inextricabilis perfectio!' Pliny exclaims; and although Buffon has sneered at the thought of the Creator of the world being 'busied in regulating the economy of a hive of bees,' or 'the wings of a beetle,' true philosophy

Discerns
A ray of heavenly light, gilding all forms
Terrestrial in the vast and the minute;
The unambiguous footsteps of the God,
Who gives its lustre to an insect's wing,
And wheels his throne upon the rolling worlds.

We shall submit to the reader I. A popular Introduction on the character and importance of these numerous tribes, and here endeavour to make our *System* as intelligible as possible to ordinary readers. II. The Anatomy and Metamorphoses of Insects. III. Their Classification, including the more particular description of their orders, and genera. IV. The History of Entomology as a science.

## PART I.

### INTRODUCTORY.

These animals are useful, if they are also occasionally injurious to agriculture. They are in many instances important borers and operators in the subsoil and interior of the earth, which they loosen and perforate with air-holes; those which feed upon the roots of grasses and other plants devour in ordinary seasons only so much as is necessary to make room for fresh shoots; those which torment the cattle occasionally act as the useful phlebotomists of over-fed animals: while innumerable tribes become a kind of scavengers to nature, removing an immense mass of nuisances and deformities from the face of the earth: other tribes furnish food to fishes and birds.

But in extensive regions of the east the locust is the food of man; and the grubs of the palm-weevil, and cerambyx damicornis are in request as a delicacy both in the East and West Indies. Even the white ant is eaten in Africa. The honey and the wax of the bee, however, outrival all the other insect contributions to the food and comfort of man. We have treated of them at considerable length under the article Apis. The extensive use of wax in all ages is well known, says an elegant writer on this subject, but it is less generally understood that wax is not the produce of the bee alone; the *wax insect* of China is a very different creature, a species of cicada in the larva state, and which, with the addition of a vegetable oil, forms the mixture of which the candles of that country consist. Donov. Ins. China. Nor ought we to forget the direct benefits to medicine which are yielded by the invaluable cantharides; or those derived to the arts from the dyes of the gall-fly, and the coccus ilicis and polonicus; and above all from those of the coccus cacti, the cochineal insect. Humboldt calculates the value of cochineal to South America as an export at 32,000 arobas, or upwards of £500,000 sterling. Lac is also the produce of a species of coccus. The whole of the silk manufactured in Europe, and the greater part of that used in China, is obtained from the

——— millions of spinning-worms
That in their green shops weave the smooth-haired silk
To deck her sons.

While the refuse of the same material forms a beautiful paper for which the Chinese are celebrated.

Such is a brief summary of the useful qualities of these tribes. The lessons of foresight, industry, and skill to be learned from insects, and still more those of their parental instincts, will not fail to add to their interest with every well regulated mind.

'The lord of the creation,' as Messrs. Kirby and Spence observe, 'plumes himself upon his powers of invention, and is proud to enumerate the various useful arts and machines to which they have given birth, not aware that 'he who teacheth man knowledge' has instructed these despised insects to anticipate him in many of them. The builders of Babel doubtless thought their invention of turning earth into artificial stone, a very happy discovery; yet a little bee had practised this art, using indeed a different process, on a small scale, and the white ants on a large one, ever since the world began. Man thinks that he stands unrivalled as an architect, and that his buildings are without a parallel among the works of the inferior orders of animals. He would be of a different opinion did he attend to the history of insects: he would find that many of them have been architects from time immemorial; that they have had their houses divided into various apartments, and containing staircases, gigantic arches, domes, colonnades, and the like; nay, that even tunnels are excavated by them so immense, compared with their own size, as to be twelve times bigger than that projected by Mr. Dodd to be carried under the Thames to Gravesend. The modern fine lady, who prides herself on the lustre and beauty of the scarlet hangings which adorn the stately walls of her drawing-room, or the carpets that cover its floor, fancying that nothing so rich and splendid was ever seen before, and pitying her vulgar ancestors, who were doomed to unsightly white-wash and rushes, is ignorant all the while that, before she or her ancestors were in existence, and even before the boasted Tyrian dye was discovered, a little insect had known how to hang the walls of its cell with tapestry of a scarlet more brilliant than any her rooms can exhibit, and that others daily weave silken carpets, both in tissue and texture infinitely superior to those she so much admires. Other arts have been equally forestalled by these creatures. What vast importance is attached to the invention of paper! For nearly 6000 years one of our commonest insects has known how to make and apply it to its purposes; and even pasteboard, superior in substance and polish to any we can produce, is manufactured by another. We

imagine that nothing short of human intellect can be equal to the construction of a diving-bell or an air-pump—yet a spider is in the daily habit of using the one, and what is more, one exactly similar in principle to ours, but more ingeniously contrived; by means of which she resides unwetted in the bosom of the water, and procures the necessary supplies of air by a much more simple process than our alternating buckets; and the caterpillar of a little moth knows how to imitate the other, producing a vacuum, when necessary for its purposes, without any piston besides its own body. If we think with wonder of the populous cities which have employed the united labors of man for many ages to bring them to their full extent, what shall we say to the white ants, which require only a few months to build a metropolis capable of containing an infinitely greater number of inhabitants than even imperial Nineveh, Babylon, Rome, or Pekin, in all their glory?'

And are insects also occasionally and largely injurious, as we suppose, to man? This should stimulate us to become acquainted with their character and habits. They are enemies not to be despised with impunity. Man himself is their frequent food; they inflict various diseases on him as well as the inferior animals; and following him into every species of habitation, they attack his person, his clothes, and his rest. In this country the bite and numbers of the gnat are frequently no trifling evil; in the New World the musquito is found in every degree of latitude. But in hot countries the bite of the latter becomes intolerable. Dr. Clarke speaks of the bodies of himself and his companions, in spite of gloves, clothes, and handkerchiefs, being rendered one entire wound, and that the consequent excessive irritation and swelling excited a considerable degree of fever. In a most sultry night, when not a breath of air was stirring, exhausted by fatigue, pain and heat, he sought shelter in his carriage; and, though almost suffocated, could not venture to open a window for fear of musquitos. Swarms nevertheless found their way into his hiding-place, and, in spite of the handkerchiefs with which he had bound up his head, filled his mouth, nostrils, and ears. In the midst of his torment he succeeded in lighting a lamp which was extinguished in a moment by such a prodigious number of these insects, that their carcasses actually filled the glass chimney, and formed a large conical heap over the burner. Mr. Jackson states that after a fifty miles' journey in Morocco they would not suffer him to rest, and that his face and hands appeared, from their bites, as if he was infected with the small pox in its worst stage.

The fire-ant and the scorpion of warmer climes often inflict mortal wounds; and there seems to be a human gad-fly which deposits its eggs in the skin of man, penetrates deeper if disturbed, and often becomes so troublesome as to occasion death. We cannot particularise the insect-enemies of the horse, the ox, or the sheep, but the tabanus of Linné is described by Bruce as far more terrible in Abyssinia than the most ferocious of the larger animals. 'The appearance, nay the very sound of it, occasions more trepidation, movements, and disorder, both in the human and brute creation, than whole herds of the most ferocious wild beasts, in tenfold greater numbers than they ever are, would produce. As soon as this plague appears and their buzzing is heard, all the cattle forsake their food, and run wildly about the plain till they die worn out with fatigue, fright, and hunger. No remedy remains for the residents on such spots, but to leave them the black earth, and hasten down to the sands of Atbara, where they remain while the rains last. Camels, and even elephants and rhinoceroses, though the two last coat themselves with an armour of mud, are attacked by this winged assassin, and afflicted with numerous tumors. All the inhabitants of the sea coast of Melinda down to Cape Gardefan, to Saba, and the south of the Red Sea, are obliged, in the beginning of the rainy season, to remove to the next sand to prevent all their stock of cattle from being destroyed. This is no partial emigration; the inhabitants of all the countries from the mountains of Abyssinia northward, to the confluence of the Nile and Astaboras, are once a year obliged to change their abode and seek protection in the sands of Beja; nor is there any alternative or means of avoiding this, though a hostile band were in the way capable of spoiling them of half their substance.' 'This fly,' says Mr. Kirby, 'is truly a Beelzebub; and perhaps it was this, or some species related to it, that was the prototype of the Philistine idol, worshipped under that name, and in the form of a fly.'

Our own agriculturists have no adversaries so terrible as several species of insects. The Hessian fly (M. pupilionis, f) is very destructive to wheat and rye, and has occasionally been a source of great alarm. The rapid multiplication of the fly is thus calculated by Leuwenhoeck: 'Let us suppose, that in the beginning of June there shall be two flies, a male and a female, and the female shall lay 144 eggs, which eggs, in the beginning of July, shall be changed into flies, one half males and the other half females, each of which females shall lay the like number of eggs; the number of flies will amount to 10,000; and, supposing the generation of them to proceed in like manner another month, their number will then be more than 700,000, all produced from one couple of flies in the space of three months.' Dr. Dwight, in his Travels in New England, relates accounts of the Hessian fly (tipula), destroying the crops of entire districts, and rendering it impossible to cultivate a particular variety of wheat. It made its first appearance in New England in 1787, and advanced at the rate of twenty miles a year. A caterpillar called the palmer-worm appeared in 1770. Its march was from west to east; walls and fences were no obstruction to its course, nor indeed was any thing else, except the sides of trenches. It destroyed, rather than devoured, ascending a stalk of grass, or grain, cutting it off in a moment, and, without staying to eat any part of it, rapidly repeating the same process on all which stood in its way. The meadows, where it most abounded, appeared as if they had been mown with a dull scythe; and the grain, as if it had been reaped with a sickle which had gaps, and therefore had

cut the stalks in a scattering, slovenly manner. In some places, immense multitudes of these animals died in the trenches, which were formed to stop their progress, and were left uncovered. The mass soon became fetid and loathsome; and was supposed in several instances, to produce a fever, distressing, and sometimes fatal. The canker-worm, another caterpillar, lives on apple-trees, and entirely strips them of their leaves in the course of four weeks. A sort of grasshopper appears occasionally in vast numbers, and not only eats every thing of the vegetable kind, but even 'the garments of laborers hung up in the field while they are at work, which they destroy in a few nours.'—*Dr. Dwight's Travels*, vol. ii. p. 384.

The gryllus genus, comprehending various grasshoppers, as they are called, locusts, and crickets, are also very injurious to agriculture. A species, apparently peculiar to New England, is mentioned by Dr. Dwight, as appearing periodically. He says, 'As I had no opportunity of examining them, I cannot describe their form or their size. Their favorite food is clover and maize. Of the latter, they devour the part which is called the silk, the immediate means of fecundating the ear, and thus prevent the kernel from coming to perfection. But their voracity extends to almost every vegetable, even to the tobacco plant and the burdock. Nor are they confined to vegetables alone. The garments of laborers, hung up in the field while they are at work, these insects destroy in a few hours, and with the same voracity they devour the loose particles which the saw leaves upon the surface of pine boards, and which, when separated, are termed saw-dust. The appearance of a board fence, from which the particles had been eaten in this manner, and which I saw, was novel and singular, and seemed the result, not of the operations of the plane, but of attrition, the cause of which I was unable to conjecture. At times, particularly a little before their disappearance, they collect in clouds, rise high in the atmosphere, and take extensive flights, of which neither the cause nor the direction has hitherto been discovered. I was authentically informed in Shaftsbury, that some persons, employed in raising the steeple of the church in Williamstown, were, while standing near the vane, covered by them; and saw at the same time vast swarms of them flying far above their heads. The customary flight of grasshoppers rarely exceeds four or five yards, and their wings are apparently so weak as to forbid excursions extended much beyond these limits. It is to be observed, however, that they customarily return, and perish on the very grounds which they have ravaged' Travels, &c. vol ii. p. 385. The plant-louse, vine-fretter, or puceron, (aphis) is a very common insect, the numerous species being denominated from the trees and plants which they infest. The males are winged, and the females without wings; they are viviparous, producing their young alive in the spring: and also oviparous, laying eggs in the autumn. As these insects derive their nourishment from the juices of the plants which they infest, nature has wisely ordained that the females should lay eggs in the autumn, though they bring forth their young alive all the spring and summer months. This is to prevent them from being starved f the want of food in winter. The young bur forth from their eggs in spring as soon as the are leaves to subsist upon. Their noxious effec are well known to the gardener. They some times migrate, and suddenly fall in showers o spots that were until then free from their ravage The aphides sometimes settle upon the tops beans, covering them so thickly as to make the appear quite black: in such cases the crops ma often be preserved by cutting off the tops, practice which is likewise adopted, indepen dently of this pest requiring it, for the purpos of increasing the yield of beans. The rose-tre is, after a mild spring, greatly injured by a specie of aphis (A. rosæ.) If it were not for the nume rous enemies to which the aphis is exposed their wonderful fecundity is such that the leaves branches, and stems of every plant would b totally covered with them. Myriads of insects o different classes, of different genera, and of dif ferent species, seem to be produced for no othe purpose than to devour the aphis. On every leaf inhabited by them we find caterpillars o different kinds. These feed not upon the lea but upon the pucerons, whom they devour wi an almost incredible rapacity. Some of thes larvæ are transformed into insects with tw wings, others into flies with four wings, and others into beetles. While in the larva state one of these glutinous insects will suck out the vitals of twenty pucerons in a quarter of an hour. Reaumur supplied a single caterpillar with more than 100 pucerons, every one of which it devoured in less than three hours.

The beetle, scarabæus melolontha, deposits eggs in the ground by burrowing. From each of these proceeds, after a short time, a whitish worm with six legs, a red head, and strong claws, which is destined to live in the earth under that form for four years, and there undergoes various changes of its skin, until it assumes its chrysalid form These creatures, sometimes in immense numbers, work between the turf and the soil in the riche meadows, devouring the roots of the grass to such a degree that the turf rises, and will roll up with almost as much ease as if it had been cut with a turfing-knife: and underneath, the soil appears turned into a soft mould for above an inch in depth, like the bed of a garden. In this the grubs lie, in a curved position, on their backs, the head and tail uppermost, and the rest of the body buried in the mould. Such are the devastations committed by the grubs of the cockchafer that a whole field of fine flourishing grass, in the summer time, will become in a few weeks withered dry, and as brittle as hay, by these grubs devouring the roots, and gnawing away all those fibre that fastened it to the ground. The turnip-beetle (generally haltica nemorum) called by farmers the fly and black-jack, were calculated to destroy o the turnip crops of Devonshire alone, in 1786 plants to the value of £100,000. The hop grower has been said to be wholly at the merc of insects. The roots of the plants are subjec to the atta-k of a species of moth, known by the name of the 'ghost' (hepialus humuli, F.); a smal beetle (haltica concinna) attacks the young shoots; and upon the presence or absence o aphides depends the whole crop of the year.

Of the locusts the Mahommedan doctors record a speech to Mahomet, says Bochart, 'We are the army of the great God; we produce ninety-nine eggs; if the hundred were completed we should consume the whole earth and all that is in it.' The Hebrew word ארבה, a locust, is probably from the root רבה, he multiplied, became great, mighty, &c., because of the immense swarms of these animals by which different countries, especially in the east, are infested. They multiply faster than any other animal, perhaps, in the creation, a circumstance frequently alluded to in Scripture. Their large open mouth is furnished with two jaws, having four incisive teeth, which traverse each other like scissars, being calculated by their mechanism, to bite or cut. Volney gives the following account of this scourge of God :—'Syria partakes, together with Egypt and Persia, and almost all the whole middle part of Asia, in that terrible scourge; I mean those clouds of locusts of which travellers have spoken; the quantity of which is incredible to any person who has not himself seen them, the earth being covered by them for several leagues round. The noise they make, in browsing the plants and trees, may be heard at a distance, like an army plundering in secret. Fire seems to follow their tracts. Wherever their legions march, the verdure disappears from the country, like a curtain drawn aside; the trees and plants, despoiled of their leaves, make the hidous appearance of winter instantly succeed to the bright scenes of spring. When these clouds of locusts take their flight, in order to surmount some obstacle, or the more rapidly to cross some desert, one may literally say, that the sun is darkened by them!' Baron de Tott has furnished a similar account.

Dr. Shaw was a witness of their devastations in Barbary, in 1724. Their first appearance was in the end of March, when the wind had been southerly for some time. In the beginning of April their numbers were so vastly increased that, in the heat of the day, they formed themselves into large swarms that appeared like clouds, and darkened the sun. In the middle of May they began to disappear, retiring into the plains to deposit their eggs. In June the young brood began to make their appearance, forming many compact bodies of several hundred yards square; which afterwards, marching forward, climbed the trees, walls, and houses, eating every thing that was green in their way. The inhabitants, to stop their progress, laid trenches all over their fields and gardens, which they filled with water. Some placed large quantities of heath, stubble, and such like combustible matter, in rows, and set them on fire on the approach of the locusts. But all this was to no purpose; for the trenches were quickly filled up, and the fires put out, by the great numbers of swarms that succeeded each other. A day or two after one of these was in motion, others that were just hatched came to glean after them, gnawing off the young branches, and the very bark of the trees. Dillon says, 'Locusts are continually seen in the southern parts of Spain, particularly in the pastures and remote uncultivated districts of Estremadura, but in general are not taken notice of, if not very numerous, as they commonly feed upon wild herbs, without preying upon gardens and cultivated lands, or making their way into houses. The peasants look on them with indifference while they are frisking about in the field, neglecting any measure to destroy them till the danger is immediate, and the favorable moment to remedy the evil is elapsed Their yearly number is not very considerable, as the males are far more numerous than the females. If an equal proportion were allowed only for ten years, their numbers would be so great as to destroy the whole vegetative system. Beasts and birds would starve for want of subsistence, and even mankind would become a prey to their ravenous appetites. In 1754 their increase was so great, from the multitudes of females, that all La Mancha and Portugal were covered with them, and totally ravaged. The horrors of famine were spread even farther, and assailed the fruitful provinces of Andalusia, Murcia, and Valencia. During the four years they committed such havoc in Estremadura, the love-apple, or lycopersicon solanum of Linnæus was the only plant that escaped their rapacious tooth, and claimed a respect to its root, leaves, flowers, and fruit. Naturalists may search for motives, which I am at a loss to discover; the more as I saw millions of them light on a field near Almaden, and devour the woollen and linen garments of the peasants, which were lying to dry on the ground. The curate of the village, a man of veracity, at whose house I was, assured me, that a tremendous body of them entered the church, and devoured the silk garments that adorned the images of the saints, not sparing even the varnish on the altars. About 10 o'clock, when the warmth of the sun has cleared their wings from the dampness of the night, the females seem uneasy at the forwardness of the males, who continuing their pursuit, they rise together 500 feet high, forming a black cloud that darkens the rays of the sun. The clear atmosphere of Spain now becomes gloomy, and the finest summer day of Estremadura more dismal than the winter of Holland. The rustling of so many millions of wings in the air seems like the trees of a forest agitated by the wind. I once saw a cloud of them go over Malaga, and move towards the sea, and pass over it, for about a quarter of a league, to the great joy of the inhabitants, who concluded they would soon be drowned; but, to their disappointment, they suddenly veered about towards the coast, and pitched upon an uncultivated space surrounded with vineyards, which they soon after quitted.'

Sometimes the coldest climates are thus desolated. In 1650 a cloud of them was seen to enter Russia in three different places, which from thence passed over into Poland and Lithuania, where the air was darkened by their numbers. In some places they were seen lying dead, heaped one upon another, to the depth of four feet: in others they covered the surface like black cloth, the trees bent with their weight, and the damage they did exceeded all computation. At a later period, in Languedoc, when the sun became hot, they took wing and fell upon the corn, devouring both leaf and ear, and that with such expedition,

that in three hours they would consume a whole field. After having eaten up the corn they attacked the vines, the pulse, the willows, and lastly the hemp, notwithstanding its bitterness. Sir H. Davy informs us that the French government, in 1813, issued a decree with a view to occasion the destruction of grasshoppers. Morocco, from 1778 to 1780, was terribly devastated by them, every green thing was eaten up, not even the bitter bark of the orange and pomegranate escaping—a most dreadful famine ensued. —The poor were seen to wander over the country, deriving a miserable subsistence from the roots of plants; and women and children followed the camels, from whose dung they picked the indigested grains of barley, which they devoured with avidity: in consequence of this, vast numbers perished, and the roads and streets exhibited the unburied carcases of the dead. On this sad occasion, fathers sold their children, and husbands their wives. When they visit a country, says Mr. Jackson, speaking of the same empire, it behoves every one to lay in provision for a famine, for they stay from three to seven years. When they have devoured all other vegetables, they attack the trees, consuming first the leaves and then the bark. From Mogador to Tangier, before the plague in 1799, the face of the earth was covered by them,—at that time a singular incident occurred at El Araiche. The whole region, from the confines of Sahara, was ravaged by them; but on the other side of the river El Kos not one of them was to be seen, though there was nothing to prevent their flying over it. Till then they had proceeded northward; but upon arriving at its banks they turned to the east, so that all the country north of El Araiche was full of pulse, fruits, and grain, exhibiting a most striking contrast to the desolation of the adjoining district. At length they were all carried, by a violent hurricane, into the Western Ocean; the shore, as in former instances, was covered by their carcases, and a pestilence was caused by the horrid stench which they emitted:—but when this evil ceased, the devastations were followed by a most abundant crop.

The description of these ravages is given no where more accurately than in various parts of Scripture: that of the prophet Joel has been often quoted (ii. 2—10, 20). The later one of the Apocalypse is equally fine. 'And the sound of their wings was as the sound of chariots, of many horses running to battle.' The reader may compare with these Mr. Southey's picture of their flight,—

> Onward they came, a dark continuous cloud
> Of congregated numbers numberless,
> The rushing of whose wings was as the sound
> Of a broad river headlong in its course
> Plunged from a mountain summit, or the roar
> Of a wild ocean in the autumn storm
> Shattering its billows on a shore of rocks.'

But the white ants are, as Linné observes, 'the great calamity' of both Indies. A similarity runs through the proceedings of the whole tribe; but the large African species, called by Smeathman termes bellicosus, is the most formidable. These live in large clay nests, from whence they excavate tunnels all round, often to the extent of several hundred feet; from these they will descend a considerable depth below the foundation of a house, and rise again through the floors; or, boring through the posts and supports of the building, enter the roof, and construct there their galleries in various directions. If a post be a convenient path to the roof, or has any weight to support, which how they discover is not easily conjectured, they will fill it with their mortar, leaving only a trackway for themselves, and thus, as it were, convert it from wood into stone, as hard as many kinds of free-stone. In this manner they soon destroy houses, and sometimes even whole villages when deserted by the inhabitants, so that in two or three years not a vestige of them will remain. They are not less expeditious in destroying the wainscoting, shelves, and other fixtures of a house than the house itself. With the most consummate art and skill, they eat away all the inside of what they attack, except a few fibres here and there which exactly suffice to keep the two sides, or top and bottom, connected, so as to retain the appearance of solidity after the reality is gone; and all the while they carefully avoid perforating the surface, unless a book or any other thing that tempts them should be standing upon it. Kæmpfer, speaking of the white ants of Japan, gives a remarkable instance of the rapidity with which these miners proceed. Upon rising one morning he observed that one of their galleries of the thickness of his little finger had been formed across his table; and, upon further examination, he found that they had bored a passage of that thickness up one foot of the table, formed a gallery across it, and then pierced down another foot into the floor: all this was done in the few hours that intervened between his retiring to rest and his rising. They make their way also with the greatest ease into trunks and boxes even though made of mahogany, and destroy papers and every thing they contain, constructing their galleries and sometimes taking up their abode in them. Hence, as Humboldt informs us, throughout all the warmer parts of equinoctial America, where these and other destructive insects abound, it is infinitely rare to find papers that go fifty or sixty years back. In one night they will devour all the boots and shoes that are left in their way; cloth, linen, or books are equally to their taste.

Mr. Forbes, on surveying a room which had been locked up during an absence of a few weeks, observed a number of advanced works in various directions towards some prints and drawings in English frames; the glasses appeared to be uncommonly dull, and the frames covered with dust. 'On attempting,' says he, 'to wipe it off, I was astonished to find the glasses fixed to the wall, not suspended in frames as I left them, but completely surrounded by an incrustation cemented by the white ants, who had actually eaten up the deal frames and back boards, and the greater part of the paper, and left the glasses upheld by the incrustation or covered way, which they had formed during their depredation.'

At the hazard of some prolixity, as well as of anticipating the more systematic parts of this article, we have thus endeavoured to impress the reader with the claims of these tribes on the

attention of mankind. If they are diminutive, we may add, they are in proportion beautiful and inimitably *finished* in their structure; if perplexing to the superficial and hasty observer to arrange and classify, they present a corresponding reward for the zeal and application of the naturalist in their endless varieties of form, color, and habits; sufficiently approximating to afford a fair outline of distinction, sufficiently various to furnish perpetually fresh discoveries of the economy of nature. 'We shall venture to affirm,' says a warm admirer of this science already noted, 'that from a knowledge of the characters, transitions, metamorphoses, and the various modes of life these little beings are destined to pursue, he will obtain a more intimate acquaintance with the great laws of animated nature, than can possibly be derived from the contemplation of any other tribe in the creation.' *Donovan.*

'With what view is the study of the mathematics so generally recommended?' says Mr. Kirby, 'Not certainly for any practical purpose—not to make the bulk of those who attend to them astronomers or engineers. But simply to exercise and strengthen the intellect—to give the mind a habit of attention and of investigation. Now for all these purposes, if I do not go so far as to assert that the mere ascertaining of the names of insects is equal to the study of the mathematics, I have no hesitation in affirming that it is nearly as effectual; and, with respect to giving a habit of minute attention, superior. Such is the intricacy of nature, such the imperfection of our present arrangements, that the discovery of the name of almost any insect is a problem, calling in all cases for acuteness and attention, and in some for a balancing of evidence, a calculation of the chances of error, as arduous as are required in a perplexed law-case; and a process of ratiocination not less strict than that which satisfies the mathematician. In proof of which assertion I need only refer any competent judge to the elaborate disquisitions of Laspeyres, called for by one work alone on the lepidopterous insects of a single district—the *Wiener Verzeichniss*, which occupy above 200 octavo pages, and must have cost the learned author nearly as much labor of mind as the *Ductor Dubitantium* did bishop Taylor.

Popular descriptions of the insect tribes, we may further observe, have been found on some important practical occasions insufficient to discriminate them. Travellers, agriculturists, and officers of government on foreign stations, ignorant of entomology as a science, often furnish us with the same kind of exaggerated and unintelligible accounts of their habits as abound in the writings of naturalists before the systematic improvements of Linné. Mr. Kirby supplies two remarkable instances of this. 'One of the greatest pests of Surinam, and other low regions in South America, is the insect called in the West Indies, where it is also troublesome, the chigoe (pulex penetrans, L.), a minute species, to the attacks of which I shall again have occasion to advert. This insect is mentioned by almost all the writers on the countries where it is found. Not fewer than eight or ten of them have endeavoured to give a full description of it, and some of them have even figured it; and yet, strange to say, it was not certainly known whether it was a flea (*pulex*) or a mite (*acarus*), till a competent naturalist undertook to investigate its history, and, in a short paper in the Swedish Transactions, proved that Linné was not mistaken in referring it to the former genus.

'The second instance of the insufficiency of popular description is even more extraordinary. In 1788 an alarm was excited in this country by the probability of importing, in cargoes of wheat from North America, the insect known by the name of the Hessian fly, whose dreadful ravages will be adverted to hereafter. However the insect tribes are in general despised, they had on that occasion ample revenge. The privy council sat day after day, anxiously debating what measures should be adopted to ward off the danger of a calamity more to be dreaded, as they well knew, than the plague or pestilence. Expresses were sent off in all directions to the officers of the customs, at the different outports, respecting the examination of cargoes,—despatches written to the ambassadors in France, Austria, Prussia, and America, to gain that information of the want of which they were now so sensible: and so important was the business deemed, that the minutes of council, and the documents collected from all quarters, fill upwards of 200 octavo pages. Fortunately England contained one illustrious naturalist, the most authentic source of information on all subjects which connect natural history with agriculture and the arts, to whom the privy council had the wisdom to apply; and it was by Sir Joseph Banks's entomological knowledge, and through his suggestions, that they were at length enabled to form some kind of judgment on the subject. This judgment was after all, however, very imperfect. As Sir Joseph Banks had never seen the Hessian fly, nor was it described in any entomological system, he called for facts respecting its nature, propagation, and economy which could be had only from America. These were obtained as speedily as possible, and consist of numerous letters from individuals; essays from magazines; the reports of the British minister there, &c. &c. One would have supposed that, from these statements, many of them drawn up by farmers who had lost entire crops by the insect, which they profess to have examined in every stage, the requisite information might have been acquired. So far, however, was this from being the case, that many of the writers seem ignorant whether the insect be a moth, a fly, or what they term a bug. And though, from the concurrent testimony of several, its being a two-winged fly seemed pretty accurately ascertained, no intelligible description is given from which any naturalist can infer to what genus it belongs, or whether it is a known species. With regard to the history of its propagation, and economy, the statements were so various and contradictory that, though he had such a mass of materials before him, Sir Joseph Banks was unable to reach any satisfactory conclusion. Nothing can more incontrovertibly demonstrate the importance of studying entomology as a science.'

Another singular instance of the effect of igno-

rance in entomology is supplied in the Edinburgh Philosophical Journal of 1824. 'Several recent travels in Persia present a frightful picture of the effects of the puncture of a parasitical insect which occurs in that country, and more especially at Miana, a small town on the route from Tauris to Teheran. According to M. Dupré, this town is surrounded by rivers, which render a residence there insupportable in summer, from the quantity of troublesome insects which are generated, and especially the mallah, a sort of tick, which produces death,' he says, 'unless the person punctured by it carefully avoids animal food and acid or fermented liquors, and makes use of sugar, which is the only effectual remedy. It shuns the light, and does not occur in houses newly built. M. M. Kotzebue agrees with Dupré in his account of the fatal effects of its puncture. Morier and other travellers give their opinion that this formidable insect is not a bug or tick; and, as it was of importance to determine the truth, M. Fischer of Waldheim obtained specimens of this alleged enemy of mankind, through the Russian ambassador in Persia, M. de Mazarovitch, and Mr. Calley, an English gentleman resident in the country. He determined it to be a tick, or one of those parasitic insects belonging to the family of acaridæ, such as occur in all countries upon dogs, oxen, and other animals; and finally proved that the accidents described by the travellers, above alluded to, have no connexion with the puncture of this insect, but have arisen from a sort of malignant pustule or anthrax, caused by the intensity of the heat in summer in this marshy country, especially in strangers. The symptoms enumerated agree precisely with those manifested by the disease in other countries, in the south of France for example, where it is equally attributed to the puncture of a venomous insect. The furia infernalis, which Linnæus had been induced, from similar prejudices, to admit as the cause of a sort of gangrenous pustule, is no doubt in the same predicament; the true cause of this disease in Sweden being to be sought for in the heats of summer exerting their influence upon a marshy country.' *Journal de Pharmacie*, No. 5, May 1824.

In all ages of the world, therefore, we find that the insect tribes have forced themselves on human attention: in this introductory part of our paper we shall only advert to the notice they have received from eminent persons of all countries prior to this study being digested into any thing like a science.

We have adverted to the early and frequent allusions to insects in the sacred writings. Professor Lichtenstein suggests, (Linn. Trans. iv. 51) that Moses in Lev. xi. 20, distinguishes the clean insects of the Fabrician genera, gryllus, locusta, truxalis, and acheta, which a person unobservant of those animals would undoubtedly have confounded; if this conjecture be well founded, it argues a corresponding discrimination of course, in the Jewish people at this period. The prophetic symbolical insects are also worth attention; the tormenting and innumerable Egyptian and African nations are compared to a fly; the well-established and cultivated Assyrians to the bee; insatiable destroyers of various nations to the locusts; Isa. vii. 18; Joel ii.; Rev. ix. 3; et infra. Solomon has sent many a sluggard, we may hope, to the ant; and seems to have treated this branch of natural history systematically; 1 Kings iv. 33.

Hippocrates, who flourished in the eightieth Olympiad, or fifth century before the Christian era, is said by Pliny to have written on insects, who quotes some remains of his entomological observations.

To Aristotle, the great ornament of the su ceeding age, we owe the foundation, as the pr sident of the Linnean Society has observed, that knowledge of the animal kingdom whi we now possess. No one can peruse his ines mable History of Animals, without confessi the writer's intimate knowledge of the gre arcana of nature.

This is an elementary work, embracing a wi and comprehensive view of the whole anim creation, and does not, except on particular c casions, descend to the description of particul species. The insect tribe obtains his attentic however, in several parts of it. In the seven chapter of his first book, he says, that the nar *εντομα* is generic, or that of a family, and th they constitute one of his four orders of exsa guineous animals, and points out with accura in what respect they differ from the mollusc crustacea, and testacea, the other three famili of this class of animals. By exsanguineous means only that they have no red blood, for speaks generally to their bodies being retain in a state of moisture by other fluids. The fi chapter of the fourth book affords a definition of the essential character of insects, which consists in the incisions or cuts either on the back or belly, and sometimes on both, by which their bodies appear to be almost divided into two or more parts.

In that portion of his work which is more particularly devoted to insects, Aristotle enters very fully into all that was known by him of their economy; and describes them as consisting of three parts, the head, trunk, and belly or abdomen; the second part, or trunk, is denominated an intermediate portion, corresponding with the back and breast in other animals; and he also mentions as a character of insects that they are furnished with feet. The subsequent passages describe different genera, or, as he terms them, tribes of insects, in which he treats of those which fly, and those which walk. Among those furnished with wings, he speaks of some having these parts entirely naked, and others that have them protected by a sheath, or covering, as in the beetle kind; as he furthermore states, that in some beetles these sheaths divide or open when the insect flies, and that in others they are inseparably united. The insects which have naked wings, he observes, possess either four, as in the bee, or two, like the musca or common fly. Some of those with four naked wings have stings at the end of the body, while beetles, and insects with two naked wings, are destitute of this apparatus; but some of the latter, he tells us,

have a proboscis or instrument at the mouth, by means of which they draw blood from other animals. The horns before the eyes (by which he means the antennæ) attract his observation, and those of the papiliones and grylli are particularly described. In his remarks on the different structure of the feet, those formed for leaping are exemplified by those of the locust, and are compared to the posterior feet of springing animals. The humming noise of certain insects in their flight, the eruca, and miscellaneous observations on the peculiarities of these animals occupy the rest of this chapter. Mr. Kirby thus exhibits a Table of this great writer's system :-

| | | | |
|---|---|---|---|
| | Coleoptera. | | |
| | Pedetica . . | | *Orthoptera saltatoria* Latr. |
| | Astomata . . | | *Hemiptera* Latr. |
| | Psychæ . . | | *Lepidoptera*. |
| Ptersta vel Ptilota | Tetraptera | Majora | *Neuroptera* L. *Orthoptera*. |
| | | *Cursoria* Latr. | |
| | | Opisthocentra | *Hymenoptera*. |
| | Diptera | Minora . . | *Musca*, *Tipula*, &c. |
| | | Emprosthocentra | *Culex*, *Stomoxys*. |
| | | | *Tabanus*. &c. |
| Pteerota simul et Aptera | Myrmex . . | | *Formica* L |
| Aptera | Pygolampis | | *Lampyris* |

'It may be further stated,' says this author, 'that Aristotle perceived also the distinction between the *mandibulata* and *haustellata* of modern authors; for he observes, that some insects having eeth are omnivorous; while others, that have only a tongue, are supported by liquid food. He appears to have regarded the *hymenoptera*, or some of them, as forming a *third*, subclass; since he clearly alludes to them, when he says that many have teeth, not for feeding, but to help them in fulfilling their instincts. How far Aristotle's ideas with regard to genera and species had attained to any degree of precision, is not easily ascertained; in other respects his knowledge of insects was more evident. As to their *anatomy*, he observes that their body is usually divided into *three* primary segments,-*head*, *trunk*, and *abdomen*; that they have an *intestinal canal*,—in some straight and simple, in others contorted,—extending from the mouth to the anus; that the *orthoptera* have a *ventricle* or gizzard. He had noticed the *drums* of the *cicada*, and that the *males* only are vocal. Other instances of the accurate observation of this great man might be adduced, but enough has been said to justify the above encomiums. His principal error was that of equivocal generation.'

A cursory perusal of Aristotle's labor on this subject, say our most eminent modern entomologists, always astonishes us; not only from their general consistency, but from their accordance with the entomological definitions of the best modern systematists: and while the opportunities of this great philosopher under the patronage of Alexander, and his own transcending qualification for the cultivation of science will account for much of what we find in his writings, when we reflect on the slow manner in which all human knowledge is attained and developed, we must be convinced that the science of nature must have made some considerable advancements before his time; and that he has derived many advantages from consulting the works of more ancient naturalists, whose labors have been lost.

Other ancient writers on insects, quoted by Athenæus, are Speusippus and Leonides, pupils of Plato and Aristotle. Xenocrates, who lived in the 110th Olympiad, treated also of insects, in his six books on Nature: Theophrastus, too, a disciple of Plato and Aristotle, notices insects in his writings; and Antigonus, who flourished under Ptolemy II. in a work published at Leipzic in 1791, alludes to the habits of insects.

Ælian, in his ΠΕΡΙ ΖΩΩΝ ΙΔΙΟΤΗΤΟΣ, without entering in a methodical manner into the history of any tribe, appropriates several chapters to particular kinds of these animals, which are described with considerable accuracy; as, the scorpion for instance, *σκορπίων*; ants, *μυρμήκων*; spiders, *ἀραχνη*; crickets, *τεττιγων*; the generation of wasps, *περὶ τῆς σφηκῶν γενέσεως*; of cantharides, *τῶν καλνίων κανθαρίδων*, &c. The poet Phile also called, from his superior knowledge of natural history, 'Phile Sapientissimi,' pleasingly describes the manners of the cicada, and the bees, *τεττίγων* and *μελιπῶν*. He entertains the idea of Ælian, that the cicadæ, by which he means the cricket (not the insect named cicada by Linnæus), lived on dew; and that the female was mute, while the male 'enchanted the grove with the harmony of song.' He speaks also of the lampyris, and other insects. The beautiful ode of Anacreon to the cicada is well known.

Other Greek writers who followed Aristotle within a few centuries, in treating upon insects, were Democritus, Neoptolemus, Aristomachus, Philistus, Nicander, Dionysius, Mago, Empedocles, Callimachus, Apollodorus, Eriphilus, Erasistratus, Asclepius, Themiso, Posidonius the stoic, Meander of Priene, Euphronius of Athens, and Meander of Heraclea, and Hesodius, who bring us down to the time of Pliny. Aristomachus, of Soli, is said to have written on Bees from the result of sixty years' attention to their economy.

Contemporary Latin writers of this era were, Pub. N. Figulus, M. T. Varro, Hyginus, Sarcana, Celsus Cornelius, Æmilius Macer, Virgil, Naso, Columella, Julius Aquila, Tarquilius, Umbritius, Cato Censorius, Domitius, Calvinus, Melissus, Favonius, Fabianus, Mutianus, Nigidius, and Manilius. No one of these contributors to this science, is, however, of moment. Pliny himself is but a compiler on the basis of Aristotle's system.

From the time of Ælian until the downfal of

the Roman empire, although the study of insects seems not to have been totally abandoned, we are ignorant of any progress being made in it. Between this period and the middle ages, the names of Titus, Ætius, Alexander, Oribasius, Trallian, Paulus Ægineta, Lucius Apuleius, Athenæus, Oppianus, Marcus Aurelius Olympius, St. Ambrosius, Epiphanius Cyprius, Decius Magnus Ausonius, Æmilius Marcus, Merboldus, and Cassiodorus Isiodorus, occur as writers upon insects, but their works are rather memorials of the interest and ignorant wonder ever excited by these tribes, than correct descriptions of any portion of them.

From the ninth to the twelfth century the Arabian botanists, Rhazes, Avicenna, Avenzoar, and Averrhoës, were occasional writers on entomology, and at about the latter period Hildegardis de Pingua wrote four books, entitled Physica St. Hildegardis, published in 1533 and 1544 in folio. Shortly after this period appeared the obscure writers, Myrepsus, Platerus, and Lianus.

Parts of the zoological work of Albertus Magnus, 'De Animalibus,' &c., who died in 1280, relate to insects. His work was first printed at Venice in the year 1519. In the thirteenth century, also, appeared a celebrated French naturalist, Bellonacensis, who wrote on insects. In the beginning of the sixteenth century, Gregorius wrote his excellent German work, on birds and fishes and insects, of which there is a Latin edition. In 1549 appeared a work of Agricola, entitled De Animantibus subterraneis, in which is a new systematic arrangement of insects. He classes them in three principal divisions, i. e. those which walk, those which fly, and those which swim; describing under each class several species. In the middle of the same century, 1552, Edward Wotton, M.D. of London, published De Differentiis Animalium; a work including some intelligent observations on insects. A small French work of 1555, under the title of Libri de Piscibus Marinis, by Rondeletius of Montpelier, treats mainly, as the title intimates, on fishes, and other aquatic animals; but it also includes insects, and accompanies some of the descriptions of them with rude figures cut in wood. Lesser states that there was in his time, in the library of the Jesuits at Ratisbon, a copy of this work in two volumes; on the margins of the leaves of which are large notes in the hand-writing of Gesner. Toward the close of this century appeared Gesner's contributions to this science, entitled Serpentium et Insectorum Libellus; Xenocrates de Natura, Libri sex: curâ Gesneri, &c. He was esteemed the most diligent enquirer into nature that his age produced; but, on the whole, he has slightly treated the subject of insects.

The voluminous work of the learned Ulysses Aldrovandus was first published in 1602. The treatise De Animalibus Insectis, is a folio volume of several hundred pages, and forms part of his larger work on animals. 'Aldrovandus,' says Mr. Donovan, 'was not merely a compiler; he availed himself of the labors of former writers, and in this respect with less servility, and certainly with more candor, than many who advance this objection against him: for he generally refers to his authorities. In the Amœnitates Academicæ, Forskal considers him as an indefatigable compiler, celebrated for the number of his works, but who thought he had acquitted himself in collecting together the undigested observations of the ancients. We cannot avoid expressing other sentiments; and, notwithstanding that he has fallen into many errors of his predecessors, this work entitles his memory to respect. In this pursuit he expended large sums of money (see our article ALDROVANDUS), travelling for information, and in the employment of artists, as he was, unfortunately, himself deficient in the talent of drawing. During the space of thirty years, he is said to have paid 200 florins annually to a painter, solely occupied in the delineation of insects. From the fatigue of these and similar researches, this indefatigable man was deprived of sight in his old age. He divided insects into two primary orders, the terrestrial and the aquatic; the first called favica, the other nonfavica. These he again subdivided into many orders; the characters of which are determined by the number, nature, and position both of the wings and feet. If the representations of the insect tribes, from the general minuteness of their characters, are more rudely expressed in the work of Aldrovandus, than the figures of the larger animals, which his volumes contain, this defect is less imputable to the liberality of Aldrovandus than the cupidity of the artist, and the existing state of the art. The best book of this period, in our own country, is Mouffet's Insectorum Theatrum, seve minorum Animalium Theatrum, 1634; and it has only cuts on wood. For the space of nearly a century after this, copper-plates were rarely introduced. This work is professedly an improvement on that of Dr. Wotton, begun in 1550, continued by Gesner, and afterwards published in its present form by Mouffet.

The next work to that of Aldrovandus, in historical order, is the Historia Animalium Sacra, of Wolfang Frenzius, published in 1612, containing much original observation. After Agricola, he distributes insects into three classes, which he names aërea, aquatica, terrea, et reptantia; and exceeds in accuracy most of his predecessors. The work of Fabius Columna, Aquatilium et Terrestrium aliquot Animalium Observationes, printed at Rome in 1616, relates, in some degree to insects; and, before we arrive at the illustrations of Hoefnagle, we have a work to notice from the pen of Archibald Simpson, the first work on entomology published in North Britain, and bearing the following title, Hieroglyphica Animalium Terrestrium, &c., quæ in Scripturis Sacris inveniuntur et plurium aliorum, cum eorum interpretationibus, 4to.

We now arrive at a period when the aid of painting, and the talents of some of its most successful professors, were devoted to the illustration of entomological works. The first of those which appeared with this decided improvement was a thin quarto, containing 226 miscellaneous figures of insects, published under the title of Diversæ Insectorum volitantium Icones ad vivum depictæ, per D. J. Hoefnagle, typisque mandatæ à N. J. Vischer. Four years after appeared the work of Mouffet which we have already noticed; and which had 500 wood-cuts.

This work is divided into two parts, the first containing twenty-nine chapters, the latter forty-two, under which are described the several tribes of insects, known among the early writers by the names of vespis, muscis, papilionibus, cicindela, blattis, cantharide, bupresti, meloe, &c., terms familiarised to the Linnæan scholar, but which are not always applied by Linnæus to the particular tribes of insects, designated by these names in the work before us. Hollar, another artist, gained considerable reputation in 1646, by his iconical work, Muscarum, Scarabæorum Vermiumque variæ figuræ et formæ omnes primo ad vivum coloribus depictæ et ex collectione Arundeliana, &c., published at Antwerp. The drawings were preserved in the Arundel cabinet; the plates are etchings in the usual style of the artist. In the same year appeared a compilation of a Dr. Johnson, entitled Historia Naturalis; which the insects, occupying one book out of four, are illustrated by twenty-eight plates engraved on copper by the author. In 1658 appeared an English translation of Mouffet's work; and in the same year Goedart's first Dutch work on insects, afterwards translated by Dr. Mey, minister of Middleburgh, under the title of Metamorphoses et Historia Naturalis Insectorum; a second volume was translated by M. P. Veezaerdt, minister in Zealand, who added some remarks of his own. For the space of about twenty years Goedart devoted great attention to the study of insects, and followed them through their progressive changes with great precision: Another translation of this latter part was afterwards published by Dr. Mey, with a farther addition of notes. Lister allows those annotators no credit for their labors: 'Goedart,' he observes, 'left his writings in Dutch: his Latin interpreters,' says he, 'have added comments indeed, but were men wholly ignorant in natural history, and their comments are mere rhapsodies, and altogether impertinent to the explication of any one history of Goedartius.' Dr. Lister re-arranged and corrected this work, and added at the same time many original observations. In 1664 a quarto, relating to insects as Objects of Microscopical Observation, was published by Power; and the following year Hook's Micrographia, treating of Minute Insects. In 1667 C. Merret published, in London, the earliest book treating exclusively of British insects, entitled Pinax rerum naturalium Britannicarum, continens Vegetabilia, Animalia, et Fossilia, in hac Insula reperta inchoatus. It contains a brief catalogue of such species as were known to Dr. Merret, with a concise descriptive sentence, by way of name. In the first volume of the Transactions of the Entomological Society of London, an account of the insects enumerated is given by Haworth.

A work entitled Tractatus Physicus de Tarantulâ, which appeared in the year 1668 at Lyons, is, though a respectable description of this curious insect, a small duodecimo of seventy pages. The same year was published in London, the general work of an English entomologist, Charleton, under the title of Onomasticon Zoicon, pluriorumque animalium differentias et nomina propria plurious linguis exponens, in which we have a systematic arrangement of insects, after the manner of Aldrovandus. There is a mantissa of this work printed in folio in Oxford in 1677.

Another elementary work on entomology was published at Leipsic, the year after the first part of Charleton's work appeared, in quarto, entitled Dissertatio de Insectis in Genere, &c. Jacob Wolff.

Redi's Experimenta circa Generationem Insectorum, for the time in which it appears (1671), is described by Mr. Donovan as an interesting little book. 'Its author combats the doctrine of equivocal generation, maintained among the ancient philosophers, and deduces its fallacy from a variety of experiments and observations, of great critical accuracy; in the course of which he demonstrates that every living creature is produced from an egg. The same work contains about thirty figures of the lice peculiar to particular birds, such as the pigeon, swan, pie, heron, &c. The same writer also published his work on the generation of insects in his native language, Esperienze in torno alla Generazione degl' Insetti, 1688. There are several other useful tracts by Redi on natural history.'

We now come to the era of Swammerdam and Ray, who first excited the attention of naturalists to the necessity of a more perfect system of entomology, and who both suggested their *metamorphoses* as the natural basis for a system. Swammerdam's original work was first printed in 1669 in Dutch, with a Latin title. It was illustrated with thirteen copper-plates. Many years elapsed before its merits were in any manner acknowledged; and it was not until after his death that it was translated into the French language. This was shortly after followed by an English, and other editions. Swammerdam divided his insects into four groups, the characters being taken from their metamorphosis and economy. The first undergo no change, such as *spiders*, *onisci*, &c. (The *Crustacea*, *Myriapoda*, *Arachnoida*, and *Acari*, of the moderns). The second includes those which, after leaving the egg, appear under the form of the perfect insect, but have no wings, in which state they eat and grow, till, having shed their skin, they appear in the winged form, and are capable of propagating their kind (The modern orders *Orthoptera*, *Dermaptera*, *Dictuoptera*, *Hemiptera*, and some of the *Neuroptera*). In the second group are comprehended those insects which appear, when hatched from the egg, under the form of a caterpillar, which, when full grown, changes into a chrysalis, where it remains until the parts are fully developed. The insects included under this head are, the orders *Coleoptera* and *Aptera*. The fourth group comprehends those which, having attained their pupa state, do not divest themselves of their skin, namely, the *Hymenoptera* and *Diptera*.

Claude Perrault, one of the most learned exotic entomologists of his age, author of several very valuable papers in the Memoirs of the French Academy, published a folio work in Paris, entitled Memoires pour servir à l'Histoire Naturelle des Animaux, 1671.

We cannot detail the numerous minor illustrations of the insect economy which now

appeared. Among the most remarkable are Dr. Lister's papers and work on spiders, relating chiefly to those indigenous in England, and arranged and designated by concise specific characters. The last is in quarto, and was printed at London in 1678; the appendix, De Araneis addenda et emendanda, &c. in 1681. There is a translation of this work in the German language, by F. W. H. Martini, printed in 1778. In 1682 this gentleman printed, at York, Johannes Godartius of Insects, done into English, and methodised, with the addition of notes; the figures etched upon copper by Mr. F. Pl. The name of Lister does not appear; but the initials at the close of the address to the reader are M. L. The impression consisted, as the preface acquaints us, but of 150 copies, which were intended only for the curious; and, in the course of nearly 130 years, it may be naturally concluded many of these must have been lost. The notes in this book are very copious. In 1685 an edition of Goedart, by Lister, appeared in Latin. In this work Dr. Lister has distributed his materials of the work into a new form of arrangement, the merits of which are too obvious, not to be noticed as an important improvement in entomology. He divides them into ten sections, as follow:—1. Those with erect wings, and angulated pupæ: *Butterflies*. 2. Those with horizontal wings, proceeding from caterpillars, called by Goedart, *Geometræ*. 3. Those with deflexed wings: *Moths*. 4. Libellulæ, or dragon-flies. 5. Bees. 6. Beetles. 7. Grasshoppers. 8. Flies with two wings. 9. Onisci, or millepedes. 10. Spiders.

In 1691 Mad. M. S. Marian, or Gräffinn, the wife of John Andrew Gräffinn, of Frankfort, published Der Raupen wunderbare verwandelung und sonderbare blumen-nahrang, which relates principally to European insects, of the order Lepidoptera. In early life this lady had imbibed a taste for the study of insects, from being occupied at times in painting these objects as ornaments to her flower-pieces. The task of painting insects she performed with tolerable accuracy; yet there is a stiffness in the outline, and 'a peculiar exuberance of style, incompatible with any faithful resemblance of nature.' Many of her original drawings are preserved in the British Museum.

In 1687 the celebrated Leuwenhoek produced his Anatomia seu interiora rerum, cum Animatarum tum Inanimatarum, ope et beneficio exquisitissimorum microscopiorum detecta. One of the first papers of this acute observer appears in the eighth volume of the Philosophical Transactions, and is entitled A Specimen of some Observations made by a Microscope contrived by M. Leuwenhoek. His communications to the world after this became numerous: we refer the curious reader to Transactions of the Royal Society, from the eighth to the thirty-second volume; and to various publications printed at Leyden and Delft in 1686, 1693, 1697, 1704, &c., for the most valuable of them. Geyereus, in 1687, wrote a treatise on the medical effect of Spanish flies (cantharides), entitled Tractatus Physico-medicus de Cantharidibus.

In 1658 Stephen Blankaart, a physician of Amsterdam, published a work, entitled Schon Berg der Rupsen, Wormen, Maden en vliegende Dierkens daar uit voort-kommende; the plates of which are admirably executed. It treats of the larvæ of various insects; but Frisch and Lyonet consider it but a superficial production. A second edition was published at Leipsic in 1690.

Three years after, Germany and the north of Europe being overrun with prodigious swarms of locusts, several naturalists of ability examined and published upon the structure of that animal. The most considerable of these productions were that of Hebenstreit, De Locustis immenso agmine aërem nostrum implentibus, et quid portendere putentur, and consists of sixty-five pages and one plate: and that of Ludolphus, entitled, Dissertatio de Locustis, anno præterito immensa copia in Germaniâ visis, cum diatribâ, quâ sententia autoris de שלוים defenditur. The last is a folio of eighty-eight pages, embellished with figures.

But we must pass to the more important works of Ray and Petiver in England, and those of the indefatigable Reaumur in France; works which are consulted to the present day, and serve in no small degree to sustain the reputation of this science. In 1702 Petiver produced the first decade of his Gazophylacium naturæ et artis, the publication of which was carried on progressively till for about ten years after, during which the work was extended to ten decades, each containing plates exclusive of the classical and topical catalogues. This work relates to insects among other animals, plants, and fossils. About twelve months before the author's death, which happened in 1718, there was, however, another work printed by him under the title of Papilionum Britanniæ Icones, &c. A work was published by Ray relating to English butterflies on this branch of science in 1705, under the title of Methodus Insectorum, seu in methodum aliqualem digesta; which must be considered only as the introduction to the great work Historia Insectorum, which the world received in 1710, through the care of Dr. Derham; for Ray did not live to see it published. Insects are in this work defined to be animals, having their bodies divided more or less by incisions. The first division, *αμεταμορφωτα*, undergo no change, and consist of, 1. Αποδα, or those without legs, under which he comprehended the class vermes (anneleides (*Cuvier*), and some intestinal worms (*entozoa*); 2. Pedata, including the classes arachnoida, myriapoda, insecta ametabolia, and some of the crustacea malacostraca edriophthalma. The second division, *μεταμορφωτα*, pass through the state of larvæ, and contain all the insecta metabolia.

Mr. Kirby supplies us with the following digested Table of this able naturalist's system:—

## TABLE OF THE ENTOMOLOGICAL SYSTEM OF RAY.

- Insecta.
  - *Ametamorphota.*
    - Aboda.
      - *Terrestria.*[1]
      - *Aquatica.*
    - Pedata.
      - *Hexapoda.*
        - Terrestria.[2]
          - *Marjora.*[2]
          - *Minora.*[3]
        - Aquatica.[4]
      - *Octopoda.*
        - Caudata.[5]
        - Noncaudata.[6]
      - 14 *poda.*
      - 24 *poda.*
      - 30 *poda.*
      - *Polypoda.*
        - Terrestria.
          - *Cylindrica.*[7]
          - *Compressa.*[8]
        - Aquatica.
          - *Corpore tereti*
          - —— *plano.*
          - *Bicaudata.*
  - *Metamorphumena.*
    - Metamorphosis semi-completa.[11]
      - *Orthoptera.*
      - *Heteroptera.*
      - *Homoptera.*
      - *Libellulina.*
      - *Ephemerina.*
    - Metamorphosis incompleta vel obtecta.
      - *Coleoptera.*
      - *Anelytra.*
        - Alis farinaceis.[12]
        - Alis membranaceis.
          - Diptera.
          - Tetraptera.
            - Gregaria et Favisica.
              - *Mellifica.*[14]
              - *Non Mellifica.*[14]
            - Solitaria non Gregaria et Favesica.
              - *Apiformia.*[15]
              - *Vespiformia.*
                - Breviora.[13]
                - Angustiora.[17]
              - *Papilioniformia.*
              - *Seticaudæ.*
              - *Seu Tripilia.*[19]
    - Metamorphosis coarctata
      - *Muscidæ et.*
      - Ichneumones minuti. L[20]

[1] These are all *Annelida.* [2] Larvæ. [3] Various *Aptera* and the Bed Bug. [4] *Nymphon* F. [5] *Scorpio.* [6] Spiders, *Phalangia*, and Mites. [7] *Julus.* [8] *Scolopendra.* [9] Annelida. [10] This section is divided by the author into thirteen tribes. [11] *Lepidoptera.* [12] *Apis Bombus*, &c. [13] *Vespidæ.* [14] *Andrena, Halictus, Nomada*, &c. [15] *Crabro, Philanthus, Cerceris*, &c. [16] *Tenthredo* L.? *Ichneumon*, &c. [17] *Trichoptera* K. [18] *Pimpla Manifestator*, and other *Ichneumonidæ*, with a long ovipositor. [19] Our author has followed Swammerdam in this unnatural separation of those *Diptera* whose metamorphosis is coarctate from the rest; and in associating with them the *Ichneumones minuti* L, whose metamorphosis is really different. Into this error both were led by system.

The intransmutabilia, or order of those which do not pass through any metamorphoses, and other valuable suggestions of this scheme, are due to Mr. Willoughby, the friend of Ray. There is an appendix to this work by Lister, Appendix de Scarabæis Britannicis, &c. Ray includes certain tribes of the vermes with insects, from which they are separated by Linnæus; it is possible that Ray might conceive, what has been since proved, that some of them at least are the larvæ of insects.

M. Reaumur published the first volume of his 'Memoires pour servir à l'Histoire des Insectes,' at Paris, in the year 1732; the five succeeding volumes appeared between that period and 1742, the whole work containing 200 plates of illustrations, and contributing materially to promote the study of entomology throughout Europe. Some papers in the Transactions of the French Academy, and the Commerc. Literar. of Nuremberg, by Maupertuis and others, had a similar tendency. In 1742 also appeared the first volume of the celebrated Albertus Sebæ, entitled Locupletissimi rerum Naturalium Thesauri accurata descriptio, et Iconibus Artificiosissimis, Expressio Latinè et Gallicè, folio. The three succeeding volumes appeared before 1765.

We are thus conducted to the important labors of Linné or Linnæus, in whose writings this study first received that scientific form of arrangement which, in regard to its great outlines, it has ever since retained. In 1735 appeared the first edition of his Systema Naturæ, sive regna tria naturæ systematicè proposita per classes, ordines, genera, et species; which distributes insects into *four* orders, according to the number and form of their wings, viz. 1. Coleoptera, or insects with covered wings. 2. Angioptera, those with naked or uncovered wings (i. e. the modern orders *lepidoptera*, *trichoptera*, *hymenoptera*, and *diptera*). 3. Hemiptera, comprehending the modern orders *hemiptera*, *homoptera*, *orthoptera*, and *dictuoptera*. 4. Aptera, including the orders now named *aptera*, *thasynura*, and *anoplura*, as well as the classes *crustacea*, *myriapoda*, and *arachnoida*, and part of the classes *vermes* and *echinodermata*. In the subsequent editions of this work, the vermes and echinodermata are separated, and constitute, with the true mollusca, and the entozoa, his class vermes.

In 1780 Linné published his twelfth and last edition of the *Systemæ Naturæ*, in which he divides insects into seven orders, deducing the characters from the wings, and still retaining the *crustacea*, *myriapoda*, and *arachnoida*, amongst the apterous insects. They were as follows:

Order I. Coleoptera (from κολεὸς, *a sheath*, and πτερὸν, *a wing*), including those insects having crustaceous shells or elytra, which shut together and form a longitudinal suture down the back. In many, the abdomen is wholly covered by these elytra; in others partially.

Order II. Hemiptera (from ἥμισυ, *half*, and πτερὸν). These animals have their elytra half crustaceous, and half membranaceous, or of a matter intermediate between leather and membrane.

Order III. Lepidoptera (from λεπὶς, *a scale*, and πτερὸν). Insects with four wings imbricated with scales.

Order IV. Neuroptera (from νεῦρον, *a nerve*, and πτερὸν). Insects with four transparent wings, reticulated with nerves.

Order V. Hymenoptera from ὑμὴν, *a membrane*, and πτερὸν). Insects with four naked membranaceous wings.

Order VI. Diptera (from δυω, *two*, and πτερὸν). Insects with two wings.

Order VII. Aptera (from ἀ, *without*, and πτερὸν.) Insects destitute of wings.

He now also divided the coleoptera into three classes, distinguished by their antennæ; i. e. 1. Those having their antennæ clavated, or gradually increasing. 2. Those having their antennæ filiform. 3. Those whose antennæ is setaceous.

Other systematic writers appeared between these intervals; and the history of what is properly the Science of Entomology we propose to resume at the conclusion of this paper. It will be sufficient to state in this place that no other arrangement is so universally intelligible to men of science as that of this great author, for no other has permanently maintained its ground. We shall not, however, omit to place before the reader the relative merits of other systems, that he may form his own judgment of them, and of the modern state of this science. At present *our* system is that which we have just detailed, with the single exception of rejecting the class Crustacea (clearly not an insect class), and which we refer to Canceræ, Monoculus, and Oniscus, in our alphabetical arrangement; and distinguishing or adding a few genera from more modern writers, some of which have been discovered since the death of Linné, and all of which he would, as we humbly conceive, have himself admitted.

The list of orders, classes, and genera, will therefore stand thus:—

Order I.—COLEOPTERA.

*Class* i. *Antennæ clavated or gradually increasing.*

Genera.

1. Scarabæus.
2. Lucanus.
3. Dermestes.
4. Hister.
5. Byrrhus, including *anthrenus*, Fabricius.
6. Gyrinus.
7. Attelabus.
8. Curculio.
9. Silpha, including *nitidula opatrum*, F.
10. Coccinella.
11. Tritoma, F. (new).

*Class* ii. *Antennæ filiform.*

Genera.

1. Bruchus.
2. Cassida.
3. Ptinus.
4. Chrysomela, including *cryptocephalus*, F.
5. Hispa.
6. Meloe, including *notoxus lutta*, F.
7. Tenebrio, the *blaps*, F.
8. Lampyris.
9. Mordella.
10. Staphylinus.

*Class iii. Antennæ setaceous.*

GENERA.

1. Cerambyx
2. Leptura.
3. Cantharis.
4. Elater.
5. Cicindela.
6. Buprestis.
7. Dytiscus, including hydrophilus F.
8. Carabus.
9. Necydalis.
10. Forficula.

Order II.—HEMIPTERA.

GENERA.

1. Blatta.
2. Gryllus.
3. Cicada.
4. Notonecta.
5. Nepa.
6. Cimex.
7. Aphis.
8. Chermes.
9. Coccus.
10. Thrips.

Order III.—LEPIDOPTERA.

GENERA.

1. Papilio.
2. Sphinx.
3. Phalæna.

Order IV.—NEUROPTERA.

GENERA.

1. Libellula.
2. Ephemera.
3. Phryganea.
4. Hemerobius.
5. Panorpa.
6. Raphidia.

Order V.—HYMENOPTERA.

GENERA.

1. Cynips.
2. Tenthredo.
3. Sirex.
4. Ichneumon.
5. Sphex.
6. Chrysis.
7. Vespa.
8. Apis.
9. Formica.
10. Mutilla.

Order VI.—DIPTERA.

GENERA.

1. Oestrus.
2. Tipula.
3. Musca.
4. Tabanus.
5. Culex.
6. Empis.
7. Conops.
8. Asilus.
9. Bombylius.
10. Hippobosca.

Order VII.—APTERA.

GENERA.

1. Lepisma.
2. Podura.
3. Pediculus.
4. Pulex.
5. Termes.

The above belong to the *insecta* class, or insects proper of Cuvier and Leach.

6. Acarus.
7. Phalangium.
8. Aranea.
9. Scorpio.

The above belong to the *arachnoidea* class of Cuvier, Lamarck, and Leach.

10. Scolopendra.
11. Julus.

The above belong to the *myriapoda* class of Cuvier and Leach.

## PART II.

### ANATOMY AND METAMORPHOSES OF INSECTS.

It will here be necessary to exhibit an outline of the general anatomy and progressive changes of these tribes, to make the systematic description of them intelligible to the general reader.

The external organic parts of insects are four, i. e. *caput*, the head; *truncus*, the trunk; *abdomen*, the abdomen; and *artus*, the limbs or extremities.

i. CAPUT.—The head, which is an important part of most insects, is distinguishable into 1. oculi, the eyes, including the stemmata, ocelli, or little eyes, as they are sometimes called; 2. antennæ, the horns; 3. os, the mouth. Internally it contains the medullary substance, or brain. It is, in most insects, sufficiently distinct from the thorax, but closely connected with the latter in all the coleoptera order. There are, in fact, two principal modes of connexion between the head and thorax of insects; one in which the point of contact is solid, and the motion depends upon the shape of this part; another in which the articulation is formed by a ligament. In the articulation of the head by contact of the solid parts, the head has commonly, at the part answering to the neck, one or two smooth tubercles, which are received into correspondent cavities on the anterior part of the thorax. This is the case with the genera scarabæus, lucanus, cerambyx, and most other coleoptera: hence they have the power of moving the head backward or forward, and of directing the mouth downward. Sometimes, in this mode of articulation, the posterior part of the head is rounded, and turns on its axis in a correspondent socket on the anterior part of the thorax, as in the brentus, &c. The axis of motion is then in the centre of the joint, and the mouth of the insect can be directed either upward or downward, or to the right and left. A third sort of solid articulation occurs when the head is truncated behind, and joins by a flat surface either to a tubercle of the thorax or to another flat and corresponding surface, as is seen in many of the hymenoptera and diptera. In some kinds of the Fabrician attelabi, this solid articulation is accomplished

by another means: the head of the insect terminates in a round tubercle behind, which is received into a correspondent cavity of the thorax, and the inferior edge of this cavity is notched: by this means the motions of the head are limited to one direction.

The forficula, mantis, and blatta, exhibit the *ligamentous* connexion of the head and thorax. In this mode of articulation, the motions of the head are remarkably free, being confined only backwards by the projection of the back. The muscles which move the head are situated within the thorax.

1. *Of the eyes* of insects.—Most have two, situated in the anterior part of the head; but several of the aptera order more; scorpions, for instance, having six, and spiders from six to eight. And in different tribes of insects they vary greatly both in situation and appearance. They have been, therefore, distinguished into *oculi approximati*, placed close together; *colorati*, of a different color from that of the head; *concolores*, of the same color with the head; *contigui*, touching one another; *fasciati*, marked with different colored stripes; *fenestrati*, having the pupil glassy and transparent; *hemisphærici*, convex, like the section of a globe; *inferi*, placed on the under side of the head; *interrupti*, broken, but continued above or below; *lunati*, crescent-shaped; *obliterati*, having the pupil scarcely distinguishable; *pedunculati*, or *stipitati*, elevated on a stalk or peduncle; *ovales*, egg-shaped; *simplices*, furnished with but one lens; *verticales*, placed on the crown of the head.

But the most important distinction of the eyes is into simple and compound; the latter being almost peculiar to themselves, and generally possessed by those insects which have but two eyes. They are reticulated, and, when magnified, are found divided into a great number of hexagonal compartments, or lenses, slightly convex, and often separated by small furrows containing a species of eyelash. Leuwenhoek reckons in each eye of the libellula, or dragon-fly, 12,544 lenses, or in both 25,088; the pictures of objects painted on such organs of vision must, of course, be some millions of times less than the images pictured on the human eye: while there is no doubt that insects still smaller have eyes adapted to discern objects some thousands of times less than themselves. To the naked eye these numerous lenses appear like net-work. Beside these eyes, many of the neuropterous and hymenopterous families have three small shining convex points placed in the middle of the head, called, by entomologists, stemmata, the utility of which was long doubted: but they are now pretty generally acknowledged to be also organs of sight. They are simple in their structure, and seem designed for viewing remote and larger objects; the other eyes smaller and nearer ones.

2. *Of the antennæ.*—Of these there are in general two, placed on the fore part of the head. They are peculiar to insects, and are plainly distinguishable from the tentaculæ of the vermes in being crustaceous; and from the palpi of insects which are more numerous and placed near the mouth. The antennæ are of great moment in distinguishing the various kinds of insects: Linné has formed his genera upon this distinction principally. We shall enumerate and explain the several different forms of them.

*Setaceæ* are those which grow gradually taper towards the extremity. *Filiformes*, such as are of the same thickness throughout. *Moniliformes* filiform, like the preceding, but consist of a series of round knobs, like a necklace of beads. *Clavatæ* such as gradually increase in size towards the extremity. *Capitatæ* are *clavatæ*, but have the extremity somewhat round. *Fissiles* are *capitatæ*; but have the capitulum, or knob, divided longitudinally into three or four parts, or laminæ, as in the scarabæi. *Perfoliatæ*, are also *capitatæ*; but have the capitulum horizontally divided, as in the dermestes. *Pectinatæ*, so called from their similitude to a comb, though they more properly resemble a feather, as in the moths and elateres. This is most obvious in the male. *Furcatæ*, or forked, having the last joint divided into parts. *Aristatæ*, such as have a lateral hair, which is either naked or furnished with smaller hairs, as in the fly. *Breviores*, those which are shorter than the body. *Longiores*, those which are longer than the body. *Mediocres*, those which are of the same length with the body: the last three varieties are distinguishable in the cerambyces.

The use of these organs is yet unascertained. There is nothing analogous to them in other animals, which has induced some naturalists to suppose them to be the organ of some extremely delicate sense unknown to us: some respectable modern writers have thought them to be the seat of hearing, others of smelling, and Mr. Huber both of touch and smell.

The activity with which these organs are used, and the abundance of medullary nerves which connect them throughout with the brain, indicate the importance of them to the insect economy. Some insects which have the antennæ small have the palpi very large, as if they were intended to answer the same purpose, or partake of the same sense, as the antennæ, and thus, by their mutual aid, supply the deficiency of the latter: the larvæ of certain insects again which have palpi have no antennæ, and others in the same state have antennæ and no palpi.

Mr. Donovan says, 'The antennæ appear to us to be rather connected with the organ of hearing than either that of feeling or smelling. The palpi, we have little doubt, are the organs of feeling, both from their texture and the manner in which insects are oftentimes observed to make use of them in touching their aliments; and the organs of smelling in insects, however singular it may be imagined, we conceive to be no other than the apertures disposed on each side the thorax and body. By the organs of hearing, we do not mean to consider them as external ears, but as being in some manner auxiliary to the organ of hearing, the seat of which we suspect to be contiguous to the base of the antennæ, the spot in which the same organ has been discovered in the cray-fish. They may answer this and some other purpose likewise.'

Bonnet thinks the antennæ the organ of smell. 'Different insects,' he observes, 'have an exquisite sense of smelling, the organ of which is yet

undiscovered. May it not reside in the antennæ? Lehmann, from the result of experiments on this subject, denies that the antennæ are the olfactory organ. He made an opening an inch wide in the side of a glass vessel, and surrounded the edge with wax, so that a close covering could be applied. An aperture was made in this covering, through which either the whole head, or the antennæ only, of an insect could be introduced. By means of a tube the glass was filled with penetrating odors, vapors, or heated air; but neither the fumes of sulphur nor burnt feathers produced the smallest effect on butterflies, bees, or beetles, whose antennæ were exposed to them.

He supposes, with Mr. Donovan, that the spiracula are the seat of smelling. 'That insects possess the faculty of smelling, says an able writer in the Edinburgh Review, No. XII., 'is clearly demonstrated. It is the most perfect of all their senses. *Beetles* of various sorts, *nitidulæ*, the different species of *dermestes, sylphæ flies*, &c., perceive, at a very considerable distance, the smell of ordure and dead bodies, and resort in swarms to the situations in which they occur, either for the purpose of procuring food or depositing their eggs. The blue flesh-fly, deceived by the cadaverous odor of a species of *arum*, alights on its flower. But though we can thus easily prove the presence of the sense of smell among insects, it is much more difficult to discover the seat of that particular sense. Several naturalists have supposed that it resides in the antennæ. Dumeril, in a dissertation published in 1799, attempts to prove that it must be situated about the entrance of the stigmata or respiratory organs, as Baster had previously supposed. His arguments, however, did not induce Latreille to relinquish the former opinion, which places it in the antennæ.'

He has assigned the following reasons for his belief: 1. The exercise of smell consists only in the action of air, impregnated with odoriferous particles, on the nervous or olfactory membrane, which transmits the sensation. If insects be endowed with an organ furnished with similar nerves, and with which air, charged with odoriferous particles, comes in contact, such an organ may be regarded as that of smell. Should the antennæ present a tissue of many nerves, what inconvenience can result from supposing that this tissue is capable of transmitting odor? Would not this hypothesis, on the contrary, be more simple and more consonant to anatomical principles than that which fixes the seat of smell at the entrance of the stigmata? Besides, this last mode of explanation will not, I presume, suit the crustaceous animals, which so nearly approach to insects. 2. Many male insects have their antennæ more developed than the females; a circumstance easily explained, if these organs are allowed to be the seat of smell. 3. Certain it is that most of those insects which live or deposit their eggs on putrid animal or vegetable matters, stagnant waters, &c., are almost uniformly distinguished by a greater development of the antennæ; such, for instance, as the scarabæus, dermestes, silpha, clerus, tenebrio, tipula, bibio, &c. These, requiring a more perfect sense of smell, are suitably organised. 4. A great number of insects which are entirely rapacious have simple antennæ, and those which are sedentary have none at all; such, for instance, as some of the acari, and a considerable part of Lamarck's arachnoidæ. 5. Insects discover their haunts and food by the sense of smell. Latreille deprived several insects of their antennæ, and found they instantly fell into a state of insensibility, and seemed to know neither their habitations nor their food, though placed close by them. Were such experiments as this prosecuted the question might soon be decided: by coating the antennæ of insects with varnish, and placing them near their natural food, it might easily be known whether the antennæ were the organs of smell; if they were the animal could not be supposed to find its way to the food, and vice versâ. 6. Nerves terminate the antennæ, the articulations of which, though externally covered with a pretty thick membrane, are hollow, lined with a soft substance, frequently of a watery consistence, the extremities of which, when exposed to the air, may receive impressions from it.

Mr. Kirby mentions a singular circumstance respecting the antennæ of the *eucera*, or long-horned bee, 'which,' says he, 'to the best of my knowledge has never before been noticed and which may possibly lead to the discovery of the use of these organs. Placed under a powerful magnifier, the last ten joints appear to be composed of innumerable hexagons, similar to those of which the eyes of these insects consist. If we reason from analogy this remarkable circumstance will lead us to conjecture that the sense, of which this part so essential to insects is the organ, may bear some relation to that conveyed by the eyes. As they are furnished with no instrument for receiving and communicating the impressions of sound, similar to the ear, that deficiency may be supplied by extraordinary means of vision. That the stemmata are of this description seems very probable; and the antennæ may, in some degree, answer a similar purpose: the circumstance just mentioned furnishes a strong presumption that they do this, at least in the case of these males; else why do they exhibit that peculiar structure which distinguishes the real eyes?

That insects do hear, by whatever organ, seems abundantly established. Lehmann states that, on observing a spider descend from the ceiling of a room by its thread in quest of a female, while he was reading, he began to read aloud: the animal, alarmed at the noise, retreated upwards; he was silent, and it returned; on again reading aloud, it testified alarm and ascended its thread; nor was its apprehension of danger dispelled, until familiarised with the sound or conquered by the object of its pursuit. This author deprived crickets, which are animals noted for acuteness of hearing, of the antennæ; yet they were equally sensible of sound as before. By an experiment of Huber's, it seems that a queen bee deprived of her antennæ, loses, if not her fecundity, all the ordinary characteristics by which she is known in the hive. Amputating one of the antennæ of a queen he found was not attended with any perceptible effect. Privation of

both, however, produced very singular consequences. M. Huber cut them from a queen whose fecundation had been retarded, so that she laid none but the eggs of males. 'From that moment a marked alteration in her conduct was seen; she traversed the combs with extraordinary rapidity, scarcely had the workers time to recede before her; and, instead of the care which a perfect queen displays in depositing her eggs in those places alone suitable for their exclusion, she dropped them at random without selecting proper cells: she retired to the most solitary parts of the hive, seeming to avoid the bees, and long remained motionless. Several workers, however, followed her there, and treated her with the most evident respect. She seldom required honey from them; but, when that was the case, she directed her trunk with a kind of uncertain feeling, sometimes on the head and sometimes on the limbs of the workers; and if she did reach their mouths it was by chance. Queens leave their hive but once in their whole lives, which is for the purpose of obtaining impregnation; they remain voluntary prisoners ever afterwards, unless in leading out a swarm. This queen, however, seemed eager to escape; she rushed towards the opening of the hive, but, finding it too small for her exit, she returned after fruitless exertion. Notwithstanding the symptoms of delirium by which she was agitated, the workers never ceased to pay her the same attention as they invariably do their queens, though she received it with indifference.' There is clearly a field of very interesting research still open to intelligent entomologists on this mysterious subject.

3. *Of the mouth.*—To the peculiarities in the structure of this part of the head a great degree of importance is attached by many of the modern systems of entomology having founded their essential characters, and Fabricius his classification of insects upon them. It consists of the following principal parts:—

i. The *labrum*, or *labium, inferius*, is the terminating portion of the mouth below, and sometimes lengthened so as to form the instrument called ligula. It is frequently bifid, and has the posterior pair of feelers placed at the base.

ii. The *labium superius*, or upper lip, is situated above the jaws, as in the scarabæus and gryllus, and is of a membranaceous nature, transverse, soft, and moveable. Linné and Fabricius are said sometimes to have confounded the upper lip with the *clypeus*, or shield of the head. 'The two parts may be distinguished by one invariable character,' says Mr. Samoulle,—'the *clypeus* is fixed, and forms a portion of the head; the upper lip is moveable, and is placed more forward.'

iii. *Lingua*, the tongue, in some insects is taper and spiral, as in the butterfly; in others it is fleshy, resembling a proboscis, and tubular, as in the fly. It constitutes the whole mouth in lepidopterous insects; and consists of two filamentous pieces, which are externally convex, concave within, and connected longitudinally by a suture along the middle both above and beneath. These, in uniting, form a cylinder, through which are drawn up the nectareous juices of the flowers on which such insects subsist. The two pieces, being not very closely unit may be separated by a needle's point. When t insect takes its food, this tube is exserted; other times it is deposited between the palpi spiral folds.

iv. The *mandibulæ*, or mandibles, are tw horny substances placed one at each side of t mouth, below the upper lip. They have a later motion, while the upper and lower lip move u and down, as in other animals; and differ fro the maxillæ, with which they are often co founded, by not having any of the palpi feelers attached to them.

v. The *maxillæ*, or jaws, are two small piece of a membranaceous consistency, indented at t extremity, and nearly all ciliated at the inne edge. They have a lateral motion, and are some times distinguished, as to their form, into *dentata* i. e. set with sharp-pointed processes; *forcipata* pincer-shaped; *furcatæ* forked; *lunulatæ*, thic in the middle and smaller towards the base an the apex; *prominentes*, placed straight before th head.

vi. The *haustellum*, or the sucker, is formed o two or more very small and delicate filaments, en closed in a sheath of two valves.

vii. The *rostrum*, or beak, also forms the prin cipal part of the mouth in many of the hemip terous order of insects. It is moveable, articulated and bent under the breast. The beak within is hollow, and contains, as in a sheath, three o more very delicate bristles, the points of which these insects introduce into the body of the animal, or substance of the plants, from which they derive their sustenance. In the cicada, nepa, and cimex, this part is very distinguishable.

viii. The *proboscis* is a trunk inserted in place of a mouth, in dipterous insects. It is a fleshy, retractile, single, often a cylindrical, instrument; the end forming two lips of a soft substance, and supposed, from the delicacy of their teguments, to possess the faculty of taste (as in the common fly) in an exquisite degree.

ix. *Palpi*, the feelers, are small, moveable, filiform, appendages to each side of the mouth in most insects, and resemble the antennæ, but are more distinctly articulated. They, as their name implies, are supposed to be the organs of touch, and vary in number in different tribes, being either two, four, or six, and are commonly inserted at each side the exterior part of the jaw. In those insects which have but one pair, they are situated generally on the upper lip; when there are two or more, the posterior ones are generally on the lower lip; and in some insects they are inserted at each side of the haustellum Composed of joints, more or less numerous, they exhibit a considerable affinity to the antennæ and they are endowed with equal, and even more extensive powers of motion. They serve therefore like the antennæ, where they are found, as an essential character in the distinction of genera; for in several of the fulgoræ, cicadæ cimices, nepæ, &c., of Linnæus, there are none: they abound most in the carnivorous tribes.

x. The *galeæ*, or shields of the mouth, are two membranaceous appendages, of a large size and cylindrical form, placed one on each side at the exterior and back part of the jaw covering the

organs of the mouth, conjointly with the lips. They are very distinct in the gryllus genus.

xi. The *clypeus*, or shield of the head, in coleopterous insects, corresponds with the frons or front of the head in other orders. In the scarabæus genus it is advanced more or less upon or over the mouth, and in some forms a sort of cap, the rim of which extends so far over the head as to conceal the mouth beneath. The anterior edge of the clypeus is sometimes mistaken for the upper lip.

ii. Truncus, the trunk: the second principal external division of an insect, comprehends that portion of its organs which is situated between the head and the abdomen; or the *thorax*, the *collar*, the *pectus*, the *sternum*, and the *scutel*.

1. The *thorax* is a term sometimes applied to the whole trunk, excepting the scutel; in a strict sense it includes only the dorsal part of the trunk, or that portion of the superior surface which lies between the head and the base of the wings. This in some insects of the orders *coleoptera* and *hemiptera*, for instance, is a single piece; in that of *lepidoptera* it comprehends several segments, and often still more in the order *hymenoptera*. The first or anterior segment, in those consisting of several pieces, has been called

2. The *collar*; but in admitting this, as it has been observed by Mr. Donovan, the coleopterous and hemipterous orders of insects can have no thorax. 'This will be rendered plain, when we consider that in the latter kinds of insects the first pair of legs arises from what is usually understood by the lower surface of the thorax; the interior segment, in hymenopterous insects, corresponds with the whole thorax in the former, for the first pair of legs arises from it in exactly the same manner. In the former, the thorax of a single piece is immediately succeeded behind by a *scutel*, while in the *hymenoptera* and *lepidoptera* a large plane of one or more joints intervenes between the true thorax and the scutel; and it is to this last-mentioned dorsal space that the term *thorax* is assigned. Hence it is evident that the language of entomology in this point is not altogether consistent; because what we denominate the collar, in *hymenoptera*, is the thorax in *coleoptera*; and in *coleoptera* we find nothing analogous to the *thorax* of the other order, except the collar.' Those insects which have a single thorax, or the first segment in such as are of a compound nature, have the first pair of legs arising from the lower surface, and in this part appear the muscles that move the head, as well as this pair of legs. The thorax in different kinds of insects varies in its shape considerably; in some it is armed with spines, in others denticulated, &c., and affords very marked generic and specific distinctions.

3. *Pectus*, the breast, the third segment of the body, is that to which the four posterior feet are attached, and in which the wings of lepidopterous insects originate. It is usually divided longitudinally at the anterior part by the sternum. In the coleoptera and hemiptera orders, the wings and elytra are placed more immediately on the back, and the breast contains the muscles that move the wings, and give action to the four posterior legs. This part is capable of being compressed and dilated considerably, as appears in the butterfly and moth tribes; a power supposed to arise from the action of some strong muscles, which also assist the flight of these insects.

4. The *sternum*, or the breast-bone, is that middle part of the breast which is situated between the base of the four posterior legs. It terminates the body of insects sometimes anteriorly in an acute angle; in others it appears bilobate: but in the far greater number ends obtusely. The sternum is not remarkable either for its magnitude or figure.

5. The *scutel*, or escutcheon (scutellum, Linn.), is a lobe-like process, situated at the posterior part of the thorax, in scutellate insects. It is not always of the same form, but generally of a sub-triangular figure: as in the coleopterous tribes for instance, its deviations inclining more or less to heart-shaped, with the tip pointing backwards, as in some of the hemiptera. In several of them the posterior end is armed with spines, or denticulations; this, however, is not usual. The scutel is more variable in point of size than in figure; in some instances it is so small as almost to escape notice, in others it is very conspicuous; covering the middle, and even expanding over the back, so as to conceal the wings and their cases.

iii. The Abdomen, the third principal division, or posterior part of an insect's body, is composed of annular joints, or segments, varying in number in different insects, and comprehending, as appendages, *cauda*, the tail; and *aculeus*, the sting. Its general form is also various and discriminated into *æquale*, when it is of the same breadth with the thorax; *barbatum*, having tuffs of hair at the sides or extremity; *falcatum*, shaped like a sickle; *petiolatum*, attached to the thorax by means of a slender elongated tube; *planum*, flat in the under part; *sessile*, attached to the thorax in its whole breath, &c. The upper part of the abdomen is the *tergum*, or back; the inferior, *venter*, the belly; and the opening at the posterior part, the *vent*: in most insects the extremity is occupied with the organs of generation. The motion of the abdomen is most visible in those insects of the hymenopterous tribe, which have that portion of the body pediculated, and is accomplished by muscles inserted in the rings.

1. *Cauda*, the tail, is a name given to any appendage which terminates the extremity of the abdomen, called *aristata*, when it terminates in a slender thread; *foliaceous*, spreading out like a leaf, as in the *blatta*; *forcipata*, shaped like a forceps; *setacea*, bristle-shaped, as in the *podura*; *biseta*, having two slender attenuated setæ, &c.

2. *Aculeus*, the sting, is an instrument of protection or offence, denominated *simplex*, when it has but one dart; *compositus*, having two or more darts; *exsertus*, projecting, or not lying within the body; *retractilis*, capable of being drawn in, as in bees and wasps; *reconditus*, always hid in the body, or seldom thrust out; *vaginatus*, enclosed in a bivalve sheath. In some tribes of insects it exists in the male, in others in the females only; but it is seldom met with in both sexes.

iv. ARTUS, the limbs or extremities, are, 1. *Pedes*, the legs. 2. *Alæ*, the wings.

1. *Pedes*, the legs, or true feet of winged insects never exceed six; though in the larvæ state many have more: and the aptera, or wingless tribes, particularly the julus and scolopendra genera, have twenty, fifty, and some of them thrice that number of feet. The scorpio, aranea, and phalangium of these tribes, have eight. The parts of the legs are *femur*, the thigh; *tibia*, the shank; and *tarsus*, the foot. *Femur* is the first or upper joint, which is *arcuatum*, bent like a circular arch; *dentatum*, having a margin with indentations; *hispidum*, set with short rigid bristles; *incrassatum*, growing thicker in the middle; *spinosum*, set with spines; *muticum*, without spines; or *saltatorium*, thick and formed for leaping, as in the locust tribe. That part which connects the thigh to the body is called its *basis*. The *tibia*, or shank, the second joint, is that part of the leg which varies its form most, according to the use which is made of the *pedes*. *Tarsus*, the foot, or last joint, consists of several articulations, which vary in number according to the insect's mode of life. To the apex of the tarsus are attached the claws, *ungues*.

The pedes as a whole are discriminated, according to their shapes and uses, as *cursorii*, formed for running; *mutici*, without claws or spines; *natatorii*, compressed and formed for swimming, as are the dytiscus and hydrophilus genera; *saltatorii*, with thick thighs fitted for leaping, as are the curculio tribes; *serrati*, toothed like a saw; *spinosi*, set with large spines.

2. *Alæ*, the wings, demand our particular attention, as forming the basis of the Linnæan arrangement.

(1.) These vary, in different insects, from two to four, and are generally attached to the lateral part of the breast, next to the lower margin of the thorax. They are always in pairs, always uniform in size and appearance, and always in a corresponding situation on each side of the insect. But in those which have two pairs, the first, reversing our carriage-wheel mechanism, are larger than those behind: they are also generally of paler hues and marks. Insects have been often described as boneless, but to the remarkable skeleton of nerves which constitute the platform, so to speak, of the wings, Dr. Leech has recently given the name of pterigostea, or wing-bones. They vary very much in disposition, but the true wing consists of these and two thin and closely united membranes which enclose them. The variety in the disposition of the nerves appears on a comparison of the wing of the common house-fly (musca domestica) with that of the panorpa, or the ephemera; or the wing of the forficula (earwig), which consists of a series of single nerves, with the elaborately wrought lattice-work of the wing of the libellula. We cannot notice other varieties of the wings, such as in the color and texture of their coating. The coleoptera have two membranous wings, which fold upon each other, forming a plait, or double, at their external margin; the fold being accommodated by a peculiar joint in the main rib of the wing, and by the peculiar disposition of the nerves in the middle. In the hemiptera the wings generally fold longitudinally, without any transverse double, so that in expansion these parts open like a fan: in the forficula, however, the wing is doubled across as in the coleoptera. The wings of the lepidoptera are neither doubled across nor folded longitudinally; they are entirely flat, and incapable of contraction and dilatation. In the papilio genus they are endowed with the power of erection, which is not the case in the phalæna genus, which have the lower wings concealed under the anterior pair, the latter being laid in a flat position over them. The neuroptera in general have the wings flat; this is not invariable: they are constantly membranaceous, and reticulated with nerves. In the hymenoptera the wings are membranaceous, generally flat, but sometimes folded, when the insect settles, as in the wasp genus.

Dipterous insects, and various kinds of the hymenoptera may be said to possess the power of flight in a more perfect degree than any other class of animals; although the muscles that assist in these movements are not well ascertained. The loud buzzing of these insects, when flying, is occasioned, as it is believed, by the wings and halteres or balancers striking against each other. The noise of the cricket, locust cerambyx, leptura, &c., by the friction of the wings, or the base of the wing-cases striking against the posterior edge of the thorax.

Terms distinguishing the wings, according to their form, figure, texture, construction, &c., are *acuminatæ*, terminating in a subulated apex; *caudatæ*, when the hinder wings are extended into processes; *crenatæ*, having the margin notched; *angulatæ*, having the margin angular; *denticulatæ*, set with teeth; *digitatæ*, divided to the base nearly like fingers; *integræ*, without indentations; *incurvatæ*, the anterior margin bent like an arch; *nervosæ*, full of nerves or vessels; *reticulatæ*, the nerves disposed like network, as in the *libellula*; *maculatæ*, or *pictæ*, spotted or marked with colored spots, bands, &c.; *variegatæ*, of different colors; *radiatæ*, the nerves diverging like rays; *ocellatæ*, marked with one or more ocelli, or eye-like spots, of which the central is termed the *pupil*, the exterior one the *iris*; *planæ*, which cannot be folded up; *plicatiles*, that admit of being folded up at pleasure; *patentes*, extended horizontally; *erectæ*, such as stand erect when the insect is at rest; *incumbentes*, which rest on the upper part of the abdomen; *deflexæ*, such as are partly incumbent, or simply bent down, &c.

(2.) The *halteres*, or poisers, are two globular bodies in insects of the order diptera; placed on slender stalks behind the wings, and seated on the thorax: and so called because they are generally supposed to keep the insect steady in its flight.

(3.) The *elytra*, or wing-cases, of the coleopterous tribe, two in number, have often been confounded with the wing itself. They are, however, entirely distinct, both in their position and structure. They are of a substance resembling leather, and for the most part moveable, opening by a longitudinal suture along the middle of the back, and are extended or raised up when the insect is in flight. Their parts are the *base*, the *apex*, the *margo*, or outer rim next the belly, and the *sutura*, the part where the elytra meet,

and form a line in the middle of the back from the base to the apex; and they are, as a whole, distinguished into—*lineata*, marked with depressed lines; *punctata*, marked with very small dots; *pubescentia*, covered with hair; *rugosa*, wrinkled; *hispida*, set with short bristles; *scabra*, rough, with hard raised points; *spinosa*, the margins set with spines; *dentata*, set with tooth-like processes; *præmorsa*, the apex terminating obtusely; *sinuata*, hollowed as if scooped out; *subulata*, linear at the base, and pointed at the apex; *integra*, completely covering the back; *dimidiata*, covering but half the back; *inæqualia*, the surface not flat; *immarginata*, without a margin, or distinct rim; *muricata*, rough with rigid spines; *striata*, slightly channelled; *convexa*, convex, &c.

The Internal Anatomy and Secretions of Insects next demand some consideration, and the most important organs that here present themselves for consideration are the brain, the stomach, and the spiracles.

1. Linné, although he does not deny the existence of a medullary thread, or *brain*, in the head of insects, as some have supposed, states that he never could discover it to be organised; and hence says, that the hippobosca equina, or horse-fly, will run, live, nay even form a union with the opposite sex, after being deprived of its head, to say nothing of many others, which are capable of living for a considerable while in a decapitated condition. From the investigations of Cuvier it is, nevertheless, obvious, that independently of a nervous medullary thread, insects have a brain distinctly organised, from which this thread and other nerves arise, and that its seat is in the head, as in the more noble tribes. The existence of a true brain in insects was believed by many writers before the time of Linnæus, and by some after; but, generally speaking, the opinion of this celebrated naturalist was assented to, and enquiry ceased, till the subject was revived by Fabricius, who is said to be the first that discovered the true brain of insects. Cuvier, however, it was that finally established the true doctrine of nature on this subject. From him we learn that the brain is not constantly of the same structure in insects; in some tribes this organ consists of one lobe, in others of two, and in others again of four; and the nerves arising from them differ, also, very materially in different families, and sometimes even in the same genera. But besides this dissimilarity, there is another circumstance far more remarkable; the form of the brain and medullary nerves in certain insects are ascertained to undergo a considerable change, as well as the external organs, in passing from the larvæ to the perfect state. Their muscles are fibres formed of fasciculi, adapted principally to but two kinds of motion, that of flexion and extension: they have strictly no salivary glands, but secrete a fluid resembling saliva in certain floating vessels of the mouth: the organ of deglutition we have already described.

2. Digestion is carried on by means of a *stomach* and an intestinal canal, of various forms and powers in different insects. For the most part they have a single stomach, but sometimes it is double, and sometimes manifold. It also varies according to the nature of the food on which the insect lives; in those which subsist on vegetable juices, it is often membranaceous, as in the bee; in those which feed on animal substances, as the bug, boat-fly, &c., it is muscular; in others the stomach is nothing but a continuation of the œsophagus, as in the cockchaffer, beetles, &c., which feed on leaves and roots. The *double stomach* is found in the coleopterous tribe, which feed on other insects, as the *cicindela*, *carabus*, &c.; the first of the two is muscular, after the manner of a gizzard; the second, a long membranaceous canal. Insects, such as the cricket and grashopper, which have many stomachs, seem to employ them much after the manner of the ruminating animals; some for the reception and digestion of food, others for its mastication and final appropriation.

3. Respiration is now well known to be carried on in insects by means of their numerous *spiracles*, which receive the air; and other vessels, called *tracheæ* and *bronchiæ*, proceeding from these pores by the sides serve for its expiration. Malpighi, Swammerdam, and Reaumur, discovered that in the caterpillar there are two air-vessels, called tracheæ, which extend throughout the whole length of the insect; from these proceed an infinite number of ramifications which are dispersed in various directions through the body; but the principal are those which form a direct communication between the tracheal vessels and the openings in the sides of the body. Of these there are nine on each side placed nearly at equal distances, one extremity terminates in the orifice of the spiracle, and the other enters the principal tracheal vessel disposed nearest, or on that side of the body. These lateral or spiracular vessels seem calculated for the reception of air; they are of a cartilaginous nature, and when cut preserve their figure; they are constantly observed in a temperate state of moisture, and communicate, in many insects, in the form of considerable vesicles, at their junction with the principal tracheæ. A caterpillar, according to Bonnet, may be retained a considerable time under water, without destroying the principle of life, and will recover soon after being taken out of the water, when it has lain till all apparent signs of life have ceased. A caterpillar partially immersed in water, or with two or three of the spiracles remaining in the open air, does not become torpid for a considerable time. One caterpillar lived eight days suspended in water, with only two of its anterior spiracles in the air. During this time it was observed, that when the insect moved itself, little streams of bubbles issued from the spiracles on the left side; from this and other experiments, however, it appeared that the anterior pair of spiracles, together with the posterior pair, are of the greatest use in respiration.

'It has been remarked,' says Mr. Donovan, 'that when we consider the great solidity of the cases or cones of certain kinds of insects, it is not easy to conceive how they can live several months under the earth in spaces so confined, and almost impervious to the air. If respiration was absolutely necessary to their existence, and

indeed if they did respire, the same situation seems to preclude a continuance of the operation, as the air would soon be corrupted, and unfit for the offices of life.

'But though it is difficult to ascertain the respiration of some insects at certain periods of existence, except from its effects in preserving life, which from analogy and collateral circumstances we are assured must depend on this cause, there are others to which respiration seems necessary in a very extraordinary degree. Many instances of this might be adduced; but in no tribe is this more clearly shown than in those of the aquatic kinds. There are a number of the latter which are obliged to keep their tails suspended on the surface of the water for this reason, and in proof of which, if they be plunged entirely under water, they become agitated and uneasy, first endeavouring to escape and rise again to the air, or, if prevented, shortly fall to the bottom and die. Some aquatic beetles resist the trial for a considerable time, while their larvæ can support the privation of air only for a few minutes. A remarkable evidence of the same kind occurs in the larvæ of musca pendula, which, though they live in the mud at the bottom of the water, have the power of extending the tube of the tail to a great length, in order to elevate it to the surface of the water; and the extremity of it is furnished with a tuft of fine hairs, which preserves that part buoyant on the surface, while the creature remains in a state of quiescence. A similar verticillated organ is placed at the tip of the tail in the larva of musca chameleon, which also lives in the water; this is expansile or retractile at the pleasure of the insect; when at rest the expanded tail rests upon the surface of the water, the remainder of the body being suspended in that element with the head downwards; and, when it is inclined to descend, it has only to retract or close up the rays of the tail to effect its purpose; an expansion of the tail will again raise the larva to the surface. Upon anatomical examination, it has been found that the body of this last mentioned larva contains two large tracheal vessels: these air-vessels extend from the head to the tail, terminate in the respiring tubes, and receive the air from them. The larva quits the water when the time of its transformation approaches, and enters into the earth, where the skin hardens and forms a case, in which the pupa is formed: soon after the change, four tubes or horns are seen projecting from the case, which some suppose to be the organ for communicating air to the interior parts of the insect: they are connected with little vesicles which are filled with air, and by which it is conveyed to the spiracles of the pupa. The larvæ of gnats, and various other little aquatic insects of the same kind, are furnished with small tubes that play on the surface of the water, and convey the air from thence into the body of the insect.'

4. Of the general circulation and ordinary secretions of insects, little is definitively known. There is evidently a contraction and dilatation of vessels observable in caterpillars, but the fluid which is supposed to supply the place of blood is not of the usual color; for which reason insects were reckoned by the ancients as *animalia exsan-guia*, bloodless animals. Swammerdam state that he has seen vessels issuing from the dorsa vessel in the silk-worm, and even succeeded i injecting them with a colored fluid; and Reaumur, in the caterpillar of the saw-fly of the ros (hylotoma rosæ, Lat.), observed, besides the *dorsa* vessel, a *ventral* one of similar form, in whic also was one of similar form, in which also wa a pulsation, but slower than that of the other This he supposes may be the principal trunk o the veins. Bonnet thought he discovered a similar vessel in a large caterpillar, but with all hi attention could perceive no motion in it. Reaumur also thought he perceived in the grub o *musca vomitaria*, in which he in vain looked fo the dorsal vessel, a fleshy part which exhibite alternate pulsations; and when with a pair o scissars he made a lateral incision in the insect amongst other parts that came out, there was on that had movements of contraction and dilatation for several minutes,—this experiment wa repeated with the same result upon several grubs Dr. Geer, as quoted by Kirby, saw the appearance of blood-vessels in the leg of the larva of *Phryganea* L. (as Lyonet did in those of a flea) and in the transparent thigh of *ornithomia avicularia* he discovered a pulse like that of an arter Baker, whose only object was to record what h *saw*, speaks of the current of the blood being re markably visible in the legs of some small *bugs* what he meant by that term is uncertain, but the could not be spiders, which he had just distin guished. This author has likewise seen a gree fluid passing through the vessels of the wings o grass-hoppers; and M. Chabrier is of opinio that insects possess the power of propelling a flui into the nerves of their wings and withdrawin it at pleasure, as they are elevated or depressed Mr. Kirby, however, contends that no circula tion exists, in insects properly so called. Lyone he observes, traced the course of so many hur dred nerves and *bronchiæ* long after they becam visible to the unassisted eye, and which were thousand times smaller than the principal blood vessels, opening into so large an organ as th supposed heart of insects might be expected t be, could never discover any thing like then His most painful researches, and repeated a tempts to inject them with colored liquors, wer unable to detect the most minute opening in th dorsal vessel, or the slighest trace of any arter or vein proceeding from or communicating wit it. Cuvier tried all the known modes of injec tion with equal want of success; and was led to th conclusion, that insects have *no circulation*; th their dorsal vessel is no heart, and therefo ought not to be called by that name: that it rather a secretory vessel, like many others that kind in those animals. As to the nature the fluid that it secretes, and its use, he thinks impossible, from our present information on tl subject, to form any satisfactory conclusio Marcel de Serres informs us—which furth proves that it can be no real heart—that th vessel may be totally removed without causi the immediate death of the insect. This opinio adds Mr. Kirby, receives further confirmati from the mode in which *respiration* is perform

in insects. In those animals that have a circulation, this takes place by means of *lungs* or *gills*; thus we find, even in the *crustacea* and *arachnoida* so nearly related to insects, that the organs of this function are true *gills*; whereas in insects, though in some of their states their respiratory tubes are branchiform, yet they are *not* gills, and the respiration is by tubes and spiracles.

There is, however, a real *blood* in insects, or at least a nutritive fluid, which may properly be called by this name, as entomologists contend, although it does not circulate by means of a vascular system. The chyle formed for their food is not absorbed by lacteal vessels, but transpires through the pores of the intestinal canal into the general cavity of the body; where, as Cuvier observes, the blood for want of a circulating system not being able to seek the air, the air goes through the blood. That is, being here exposed to the influence of the oxygen in the air-vessels, it becomes, though retaining its color, a different fluid from what it was before, and analogous to blood in its use and office. In many insects, if we break only an antenna or a leg, a drop of fluid flows out at the wound. In larvæ, the fluid which bathes all the internal parts and organs is not only sufficient for their nutriment, but a large quantity of seemingly superfluous blood remains that is not wanted for this purpose. In the arachnoidæ, however, there seems to be a real circulation. See the account of that genus in our systematic description.

5. The distinction of *sex* is a portion of insect anatomy equally curious. The same difference in this respect exists in insects as in other animals, and they even appear more disposed to increase their species than most others: many of them, when perfect, seeming to be created for no other purpose but to propagate their species. Thus the silk-worm, when it arrives at its perfect or moth state, is incapable of eating, and can hardly fly: it endeavours only to propagate its species; after which the male immediately dies, and the female as soon as she has deposited her eggs.

The males and females of many insects are with difficulty distinguished. In some genera, however, they differ so widely, that an unskilful person might easily take the male and female of the same insect for different species; as, for instance, in the phalæna humuli, piniaria, russula; each sex of which differs in color. This dissimilarity is still more apparent in some insects, in which the male has wings and the female none; as in the coccus, lampyris, phalæna antiqua, brumata, lichenella. And as most insects remain long in copulation, as we may see in the tipula and silk-worm, the winged males fly with the wingless females, and carry them about from one place to another, as in the phalæna antiqua. It is, however, no certain rule that, when one insect of the same species is found to have wings, and the other to be without them, the former must necessarily be the male and the latter the female. The aphides, for instance, are an exception; and besides these, individuals of both sexes, and of the same species, are found without wings, as the carabi majores, tenebriones, meloes, cimices. The gryllus pedestris is likewise destitute of wings; and might have passed for a gryllus in its pupa state, had it not been seen in copulation; for it is well known that no insect can propagate its species till it arrives at its last or perfect state. In the different states which precede the perfect condition, it should also be remarked that there are no sexual organs, or at least none that are developed. At least this is the fact with regard to most insects: for 'among the cimices,' says Mr. Donovan, 'there can be no doubt in our own mind from actual observation, that the semi-nymphs of certain species do unite with their mates, and afterwards become winged insects. We are not without suspicion that many of the grylli, like the pedestris, possess the same faculty, and are afterwards furnished with wings.'

The male is, in most of the insect tribes, smaller than the female; but this difference varies considerably. In lepidopterous insects the female is only perceptibly larger than the other sex in general; in the ant it is six times larger than the male: in the coccus twelve or fifteen times, and in the termes the female is at least 200 times larger than the male. In many of the larger tribes of beetles (geotrupes) the head of the males is embellished with one, two, or more distinct and prominent horns, which, in a number of species, are very considerable in size; while the head of the female has only a few slight protuberances instead of horns, and is sometimes even destitute of them. The antennæ of male moths, again, are almost invariably larger or more deeply pectinated than in the female, and this difference may be traced from the broad feather antennæ of the largest bombyces, to the setaceous antennæ of the noctuæ: however slightly the antennæ of the male appear pectinated, those of the female will be found still less so. The abdomen in this order is also smaller than that of the female. The sexual organs of insects are usually placed at the extremity of the abdomen. But this is not always the case; there are insects, and among those the spiders, which have the male organs placed at the tip of the feelers, one at the extremity of each; every individual of these creatures being furnished with two. The female organ is beneath the abdomen. '*Araneus mas* palpos habet clavatos, qui penes sunt, juxta os utrinque unicum, quæ clavæ sexum nec speciem distinguunt; et fœmina vulvas suas habet in abdomine juxta pectus. Huic vero si unquam vere dixeris, '*Res plena timoris amor*:' si enim procus inauspicato accesserit, fœmina ipsum devorat; quod etiam sit, si non statim se retraxerit.' In the libellulæ (dragon-flies), the males have the sexual organ situated under the breast, while that of the female is at the extremity of the abdomen. But except at the period of their amours the sexual organs of insects are not perceptible, those of the male at other times are drawn within the body.

Besides the male and female, a third sex exists in some insects called *neuter*. As these have not the distinguishing parts of either sex, they may be considered as eunuchs or infertile. We know of no instance of this kind in any other class of animals, nor in vegetables, except in the class syngenesia, or in the opulus. This kind of sex is only found among those insects which form themselves into societies, as bees, wasps, and

ants: and here these kinds of eunuchs are real slaves, as on them lies the chief business of the economy. Each family of bees has one female only (called the queen), many males, and an almost innumerable quantity of neuters. See Apis. The same economy nearly takes place in wasps, where the young females, which are impregnated in the autumn, live through the winter, and in the spring propagate their species; but the queen, together with all the males, perish in the winter. See Vespa. Among ants the neuters form a hill in the shape of a cone, that the water may run off it, and place those which are in the pupa state on that side of it which is least exposed to the heat of the sun. At a considerable distance from these are found the habitations of the males and females, to whom the most ready obedience is yielded by the neuters, till a new offspring succeeds, and then they oblige them to quit their habitations. But those ants which live entirely under ground, provide better for themselves in this respect: for a little before their nuptials, they quit their habitation of their own accord, and after swarming, in the manner of bees, they copulate in the air; and each, retiring to some new habitation, founds a new family. See Formica.

No *hermaphrodites* have as yet been discovered among insects. There is something very singular, however, in the propagation of the aphides. A female aphis, once impregnated, can produce young, which will continue to produce others without any fresh impregnation, even to the fifth or sixth progeny; after which a new impregnation must take place. See Aphis.

Neither the males nor females of insects in general are remarkably faithful: that is, they deviate occasionally into amours with other species. This is particularly observable in the coccinella genus. The hybrid insects thus produced are unfruitful: they resemble the female most in face, and the male parent in spots and colors.

The Metamorphoses of insects have attracted the attention of mankind from an early period, and were the fruitful source of fabulous and amatory allusions, known to every reader of Ovid and Anacreon. Nor are the splendid religious systems of the east without their due share of allusion to these singular changes:—'A priest who has drunk wine shall migrate into a moth or fly, feeding on ordure,' say the Institutes of Menu. 'He who steals the gold of a priest shall pass a thousand times into the bodies of spiders. If a man shall steal honey, he shall be born a great stinging gnat; if oil, an oil-drinking beetle; if salt, a cicada; if a household utensil, an ichneumon fly.'

All insects, except those of the aptera order, are continually undergoing some transformation. Insects change first from the (ovum) egg, into the (larva) caterpillar, or maggot; then into the (pupa) chrysalis; and lastly, into the (imago) fly, or perfect state. During each of these changes, their appearance differs as much as night and day. The insect, as soon as it came out of the egg, was by former entomologists called eruca; but as this is synonymous with the botanic name sisymbrium, it was changed by Linnæus for the larva.

1. *Larva*, a name expressive of the insect' being, in this state, as it were masked, having it true appearance concealed. Under this mask o skin the entire insect, such as it afterwards ap pears when perfect, lies concealed, envelope only in its tender wings, and putting on a sof and pulpy appearance; insomuch that Swammer dam was able to demonstrate the butterfly wit its wings to exist in a caterpillar, though it bor but a faint resemblance to its future perfection The insect, therefore, in this state, undergoes lit tle other alteration but the change of its skir The larvæ are, for the most part, larger than th insect when perfect, and are very voracious. Th caterpillar of the cabbage-butterfly eats doubl what it would seem to require from its size; bu its growth is not adequate to its voracity.

2. *Pupa.*—The insect in this state was formerl called chrysalis, or aurelia: but, as the appear ance of gilding is confined to a few butterflie only, the term pupa has been adopted in its stead because the lepidoptera, especially resemble a infant in swaddling clothes; and in this state all except those of the hemiptera class, take n nourishment.

3. *Imago* is the third state. This name is give by Linnæus to the third change, in which th insect appears in its proper shape and colors and, as it undergoes no more transformations, i is called perfect. In this state it flies, is capabl of propagating its species, and receives tru antennæ; which before, in most insects, wer scarcely apparent.

As the shape of the pupa is different, in differ ent classes of insects, it assumes different names thus it is called *coarctata*, when it is round, and as it were turned, without the least resemblanc of the structure of the insect; as in the diptera *obtecta*, when it consists as it were of two parts one of which surrounds the head and thorax, an the other the abdomen: *incompleta*, when the have wings and feet, but are not capable o moving them; as in most of the hymenoptera *semicompleta*, in which they walk or run, bu have only the rudiments of wings: *completa*, i which they immediately obtain the perfect form of the insect, without undergoing any mor change: as in those of the aptera class, excep only the flea. The bed-bug also belongs to thi class.

The spider undergoes frequent transformations though only in the color of its skin. The scolo pendræ, when young, have fewer feet than whe they are full grown. All insects, as soon as the undergo the third change, are arrived at their ful growth; nor do we find any difference in th size of the same species of insect in the sam countries, unless, during its caterpillar state, i has not had a sufficiency of proper food.

Such is a general outline of their metamor phoses. Many speculations of modern entomo logists on their causes and progress are mor curious than determinate of either.

Dr. Herold, the advocate of what is called th new hypothesis, thinks the successive skins o the caterpillar, the pupa-case, the future butter fly, and its parts and organs, except those of sex which he discovered in the newly excluded larva do not pre-exist as germes, but are formed suc

cessively from the rete mucosum, which itself is formed anew upon every change of skin from what he denominates the blood, or the chyle, after it has passed through the pores of the intestinal canal into the general cavity of the body, where, being oxygenated by the air-vessels, it performs the nutritive functions of the blood. He attributes these formations to a vis formatrix (Bildende Kraft.) The caul, or epiploon (Fettmasse), the corps graisseux of Reaumur, &c., which he supposes to be formed from the superfluous blood, he allows, with most physiologists, to be stored up in the larva, that in the pupa state it may serve for the development of the imago. But he differs from them in asserting that in this state it is destined to two distinct purposes,—first, for the production of the muscles of the butterfly, which he affirms are generated from it in the shape of slender bundles of fibres; and, secondly, for the development and nutrition of the organs formed in the larva, to effect which, he says, it is dissolved again into the mass of blood, and, being oxygenated by the air-vessels, becomes fit for nutrition, whence the epiploon appears to be a kind of concrete chyle.

We find it impossible, as Mr. Kirby observes, to conceive how, by the action of second causes, without the intervention of the first cause, the butterfly should be formed in the caterpillar, unless it pre-exists there as a germe or fœtus. 'Is it not clear,' asks Dr. Virey, in his lively manner, 'as Blumenbach and other physiologists maintain, that there is a formative power, a *nisus formativus*, which organises the embryo? Admirable discovery!' says he, 'which teaches us that the fœtus forms itself because it forms itself! as if you should affirm that the stone falls because it falls! Had Dr. Herold considered what Bonnet says, with as much good sense as modesty,' observes the English writer above quoted, 'he would never have imagined that his discovering the organs of the butterfly one after the other at certain periods in the caterpillar, was any sound argument against their pre-existence and co-existence as germes. 'Organs,' says that amiable and excellent physiologist, 'that have no existence as to us, exist as they respect the embryo, and perform their essential functions; the term of their becoming visible is that which has been erroneously mistaken for the period of their existence.' This has been Dr. Herold's grand error; he mistook the commencement of the *appearance* of the organs of the butterfly for that of their *existence*, and yet the early appearance of the sexual organs ought to have led him to a conclusion the reverse of that which he has adopted. Dr. Virey has observed, with great truth, that 'Every being has a peculiar and unique nature, which would be impossible if the body was composed of parts made at several intervals, and without a uniform power that acts by concert.'

We cannot go far into the various speculations of entomological writers on this intricate subject. The common and best supported hypothesis is, that every caterpillar, at its first exclusion, contains within itself the germe of the future butterfly and of all its envelopes, which, successively presenting themselves, are thrown off, till it appears in perfection and beauty, with all its parts and organs, when no further development takes place.

The whole class of insects is strictly oviparous. Some tribes, indeed, bring into the world living young ones, and have on that account been considered as *viviparous*, but they are few and the denomination is incorrect, for the embryos of none of these are nourished, as in the true viviparou animals, within a uterus by means of a placenta, but receive their development within true eggs which are hatched within the body of the mother. Leuwenhoek found eggs in the abdomen of a female scorpion; and Reaumur has made similar observations with regard to the flesh-fly (musca carnaria), and other viviparous flies as they have been called. A similar mode of production takes place also in vipers and some other reptiles, which have hence been denominated *ovo-viviparous*, to distinguish them from the true viviparous animals—the class *mammalia*.

By far the larger portion of insects then is oviparous in the ordinary acceptation of the term. The ovo-viviparous tribes at present known are scorpions; the flesh-fly, and several other flies; a minute gnat belonging to Latreille's family of *tipulariæ*; some species of *coccus*; some bugs (cimicidæ;) and most aphides, which last also exhibit the singular fact of individuals of the same species being some oviparous and others ovo-viviparous, the former being longer in proportion to the latter. But Bonnet is of opinion that the eggs of the first are not perfect eggs, but a kind of cocoon, which defends the larva, already formed in some degree, from the cold of winter. When excluded from the body of the mother, or from the eggs, some insects appear nearly in the form of their parents, which, with a very slight alteration, they always retain; others, and the greater number, assume an appearance totally different from that of their parents, which they acquire only after passing through various changes. It is to these last, which have chiefly engaged the attention of entomologists, that the title of metamorphoses has been often restricted.

Insects, as to their original mode of appearance, may be divided therefore, into—

i. Ovo-viviparous, sub-divided into

1. *Larviparous*, proceeding from the matrix of the mother in the state of larvæ, as the scorpion (*scorpio*); the flesh-fly (*musca*); the plant-louse (*aphis*), &c.

2. *Pupiparous*, remaining in the matrix of the mother during the larva state, and coming forth in that of pupa, as the forest-fly (*hippobosca equina*); the sheep-louse (*melaphagus ovinus*); the bat-louse (*nycteribia vespertilionis*), &c. All other insects are,

ii. Oviparous:

And first of the latter. By far the greater number of insects extrude their eggs *singly*, a longer interval elapsing between the passage of each egg in some than in others. In those tribes which place their eggs in groups, such as most butterflies and moths, and many beetles, they pass from the ——— usually with great rapidity; while in the *ich*— *-onidæ*, *sphegidæ*, *œstri*, and other parasitic genera, which usually deposit their eggs singly, an interval of some minutes, hours, or perhaps even days, intervenes, between the

extrusion of each egg. A few *diptera* extrude them in a sort of chain or neck-lace, each egg being connected by a glutinous matter with that which precedes and follows it. Insects of the *diptera* order also, like frogs and toads, commit their eggs to the water, imbedded in masses of jelly. Dr. Derham describes two different kinds of them, in one of which the eggs were laid in parallel rows end to end, and in another in a single row, in which the sides were parallel. The mode of exclusion of the eggs of the blattæ, which, according to Mr. Kirby, are engaged for a whole week in the business of oviposition, is very singular: the female deposits one or two large suboviform capsules, as large as half their abdomen, rounded on one side, and on the other straight and serrated, which at first is white and soft, but soon becomes brown and hard. This egg-case, as it may be called, contains sixteen or eighteen eggs arranged in a double series, and the cock-roaches when hatched, make their escape through a cleft in its straight side, which shuts so accurately when they have quitted it, that at first it appears as entire as before.

Those insects that deposit their eggs in groups often protect them with a kind of covering. Thus the *lycosa saccata*, Latr., a kind of spider, surrounds her eggs with a silken bag, in which she constantly carries them about with her, defending them to the last extremity. Many other spiders, indeed nearly the whole tribe, fabricate similar pouches of various sizes and texture. Madam Merian gives an account of two species of blatta, which she affirms carry an egg-pouch about with them; one species (*B. gigantea*), she describes as carrying its eggs in a globular pouch or web like certain spiders, and the other in a bag, which when alarmed it drops, and makes off. But this admirable paintress of natural objects was not always correct in her statements: it seems very improbable, from the habits of those species of which we know the history, that any of them should spin a pouch of web for their eggs.

Most commonly the female insect leaves her cluster of eggs without any other covering than the varnish with which in this case they are usually besmeared. Either they are deposited in summer, and will soon be hatched, or they are of a substance calculated to encounter and resist the severities of the season. But many species, whose eggs are more tender, or have to resist the cold and wet of winter, defend them in the most ingenious manner with a clothing of different kinds of substance. *Cassidis viridis*, a tortoise beetle, Rösel tells us, covers her groups of eggs with a partially transparent membrane. *Arctia salicis* F., a moth, common on willows, wholly conceals hers with a white frothy substance, which, when dry, is partly friable and partly cottony, and, being insoluble in water, effectually protects them from the weather. The female of *lophyrus pini*, a saw fly, having by means of her double saw made a suitable longitudinal incision in the leaf of a fir, and placed in it her eggs in a single row end to end, stops it up with a green frothy fluid mixed with the small pieces of leaf detached by her saws, which, when dry, becomes friable; a necessary precaution, since these eggs are extremely brittle. *Arctia chrysorrhæa, hypogynina dispar*, and several other moths, surround theirs with an equally impervious and more singular clothing—*hair* stripped from their own bodies. With this material, which they pluck by means of their pincer-like ovipositor, they first form a soft couch on the surface of some leaf: they then place upon it successively layers of eggs, and surround them with a similar downy coating, and, when the whole number is deposited, cover the surface with a roof of hairs, which cannot be too much admired; for those used for the interior of the nest are placed without order, but those employed externally are arranged with as much art and skill as the tiles of a roof, and as effectually keep out the water, one layer resting partly on the other, and all having the same direction, so that the whole resembles a well-brushed piece of shaggy cloth or fur. When the mother has finished this labor, which often occupies her for twenty-four hours, and sometimes even twice that period, her body, which before was extremely hairy, is almost wholly naked—she has stripped herself to supply clothing to her offspring, and having performed this last duty she expires. The female moths, which thus protect their eggs, are often furnished with an extraordinary quantity of hair about the anus for this express purpose; and Reaumur conjectures, that the singular anal patch of scales resembling those of the wings, but considerably larger, which is found in the female of *lasiocampa pityocampa*, is destined for the same purpose. Reaumur, ii. 97, 159. Reaumur had once brought to him a nidus of eggs clothed still more curiously: they surrounded a twig in a spiral direction, like those of *lasiocampa neustria*, but were much more numerous, and were thickly covered with fine down, not pressed close, but standing off horizontally, which assumed much the same appearance as a fox's tail would if twisted spirally round a branch. A similar procedure was observed by Dr. Geer in some species of aphides (*A. alni* and *A. pruni*), which covered their eggs with a white cottony down detached from their belly by means of their hind legs. In this case, however, the eggs were separately coated with the down, but there was no general covering to the group. Several insects make the leaves and other parts of plants serve as coverings for their eggs.

The number of eggs laid by different species of insects, even of the same natural family, is extremely various. Mr. Kirby has collected the following astonishing facts on the subject of their fertility. The pupiparous insects may be regarded as producing only a single egg; *musca meridiana* L. a common fly, lays two; others six or eight; the flea twelve; the burying beetle (*necrophorus vespillo*) thirty; May-flies (*trichoptera* K.) under 100; the silk-worm moth about 500; the great-coat moth (cossus ligniperda), 1000; *acarus americanus* more than 1000; the tiger-moth (*callimorpha caja*), 16,000; some cocci 2000, others 4000; the female wasp at least 30,000; the queen bee varies considerably in the number of eggs that she produces in one season, in some cases it may amount to 40,000 or 50,000, or more; a small hemipterous insect, resembling a little moth (*aleyrodes proletella* Latr.), 200,000.

But all these are left far behind by one of the white ants (*termes fatale* F. *bellicosus* Smeath), the female of this insect extruding from her enormous matrix not less than sixty eggs in a minute, which gives 3600 in an hour, 86,400 in a day, 2,419,200 in a lunar month, and the enormous number of 211,449,600 in a year: probably she does not always continue laying at this rate: but if the sum be let as low as possible, it will exceed that produced by any other known animal in the creation.

2. In the *second*, or larva state, or immediately after exclusion from the egg, insects are soft, without wings, and in a shape usually somewhat like worms. In English we have no common term that applies to the second state of all insects, but have applied several to that of different tribes. Thus we call the colored and often hairy larvæ of butterflies and moths *caterpillars*; the white and more compact larvæ of flies, many beetles, &c., grubs or *maggots*; and the depressed larvæ of many other insects *worms*. In this period, during which they eat, as we have said, voraciously, and cast their skin several times, insects live a shorter or longer period, some only a few days or weeks, others several months or years. Peculiarities of the larvæ state of insects belong rather to their systematic description; but we may observe that the larvæ of most hemipterous insects at present known are furnished with six legs, antennæ, and organs of the mouth, as in the perfect insect from which they originate; and agree with them in most other respects, except in being entirely destitute of wings. The larvæ of the mantes are carnivorous; those of the grylli feed on plants and farinaceous matter; the nepæ are aquatic, and subsist on water insects; the cimices, inhabitants of the land, and a most extensive tribe, are entirely carnivorous, and, like that odious and well-known insect of the same genus, the common bug, derive their sustenance from the blood and juices, extracted by means of their proboscis, from the bodies of other animals, those of the largest kinds, and man not excepted. The caterpillars of the butterfly, sphinx, and moth tribes, form a very numerous series; and these, from a variety of concurrent circumstances, have been more particularly observed than any others.

The greater part of those lepidopterous insects which come forth in the spring or summer perish or disappear at the approach of winter. There are few, the period of whose life exceeds that of a year.

Caterpillars are uniformly hatched from the egg, and at first are small and feeble, but grow in strength as they increase in size. The body of the caterpillar consists of twelve rings; the head is connected with the first, and is hard and crustaceous. No caterpillar of the moth or butterfly has less than eight, or more than sixteen; those which have more than sixteen belong to some other order of insects. The six anterior feet, or those next the head, are hard and scaly, pointed and fixed to the first three rings of the body, and are in number and texture the same in all lepidopterous larvæ. The posterior feet are soft, flexible, or membranaceous; they vary both in figure and number, and are observable only in the caterpillar state, the perfect insect having only six feet, the rudiments of which are the six anterior scaly feet before mentioned. These spurious feet are either smooth or hairy, soft to the touch, or hard, like shagreen. On each side of the body are nine small oval apertures, which are considered as the organs of respiration, and are called spiracles. The head is covered with a shelly substance, and on each side are five or six small black spots, which are supposed to be the eyes. Some caterpillars grow to a very large size.

The changes of the caterpillar, whose life is one continued succession of metamorphosis, are thus detailed by Mr. Donovan:—'It often moults its skin before it attains its full growth. This is the more singular, because when it moults it is not simply the skin that is changed; for we find in the exuvia the skull, jaws, and all the exterior parts, both scaly and membranaceous, which compose its upper and under lip; its antennæ, palpi, and even those crustaceous pieces within the head, which serve as a fixed basis to a number of muscles; we also find in the exuvia the spiracles, the claws, and sheaths of the anterior legs, and in general the traces of all that is visible in the external figure of the caterpillar. The change in the caterpillar is effected by the creature's withdrawing itself from the outer skin as from a sheath, when it finds itself incommoded from being confined within a narrow compass. But to accomplish this change is the work of some labor and time. Those caterpillars who live in society, and have a kind of nest or habitation, retire thither to change their skin, fixing the hooks of the feet, during the operation, firmly in the web of their nest. Some of the solitary species spin at this time a slender web, to which they affix themselves. A day or two before the critical moment approaches, the insect ceases to eat, and loses its usual activity; in proportion as the time of its change approaches, the color of the caterpillar declines in vigor, the skin hardens and becomes withered, and is soon incapable of receiving those circulating juices by which it was heretofore nourished and supported. The insect is now seen at intervals with its back elevated, or with the body stretched to the utmost extent: sometimes raising its head, moving it from one side to another, and then letting it fall again. Near the change the second and third rings are seen considerably swollen. By these internal efforts, the old parts are stretched and distended as much as possible, an operation attended with difficulty, as the new parts are all weak and tender. However, by repeated exertions, all the vessels which conveyed nourishment to the exterior skin are disengaged, and cease to act, and a slit is made on the back, generally beginning at the second or third ring. The new skin may now be just perceived, being distinguished by its freshness and brightness of color. The caterpillar then presses the body like a wedge into this opening, by which means it is soon torn down from the first to the fourth ring: this renders it large enough for the caterpillar to pass through. The caterpillar generally fasts a whole day after each moulting, for it is necessary that the parts should

acquire a certain degree of consistency before its organs can perform their ordinary functions. Many perish under that operation. The caterpillar always appears much larger after it has quitted the exuvia than before; for the body had grown under the old skin till it was become too large for it, and the parts being soft they were much compressed, but as soon as this skin is cast off, the parts distend, and with them the new skin, which is yet of a flexible and tender texture, so that their increase in size at each moulting is considerable. Some caterpillars in changing their skin alter very much in color and appearance, sometimes the skin from being smooth becomes covered with hair, or spines, or tubercles, and others that are in one stage hairy have the skin smooth in the next. No sex is is developed in the caterpillar state.

The caterpillars of lepidopterous insects seem destitute of all means of defence, and are the prey of birds and other voracious creatures. Nature has not, however, left the whole tribe in this defenceless state, some kinds are armed with strong and powerful spines disposed in a verticillate manner round the annulations of the body, and which, if they be insufficient to annoy others, serve at least, in some measure, as the means of self-protection. There are others, chiefly the inhabitants of the warmers climate, whose bodies present an armament of spines not unlike that of the hedge-hog or porcupine, and these placed in such a formidable manner as must either forbid the approach of other small creatures, or punish their temerity. Some few of the North American species are of this description. In others we see the rings tuberculated, and every tubercle beset with ramose spines, the branches of which, intertexting with each other, form an almost impenetrable net-work of spines. Others again are thickly clothed with spines and hair intermingled, which may be sufficient to guard them against the attack of some of their inferior enemies. Some species with the body covered only with a thin skin, and therefore apparently exposed to the annoyance of every other, have the jaws so powerful, and the disposition so ravenous and fierce, that they constantly attack, and most commonly with success, the larva of other species much larger than themselves. At the extremity of the body, in the larvæ of the sphinges, is a remarkable recurvate spine or horn, formidable in appearance, but harmless in its nature, and which is vulgarly supposed to be its weapon of defence. These insects, or at least some of them, are not, however, without the means of annoyance, for it appears they possess the ability of discharging from their mouth or vent a fœtid liquor, the scent of which, should it fall on the skin, cannot easily be removed even by washing, and which may be supposed powerful enough to repel other insects. This ability in the sphinx tribe of caterpillars is admitted on the authority of some credible authors; the like circumstance is more commonly observed in the larvæ of some species of tenthredo. The caterpillars of many insects of the butterfly tribe feed close to the ground, or under the surface, subsisting on the lower parts or roots of plants; and, for this reason, many kinds are seldom seen, and others remain unknown. The most curious tribes of larva among the hymenopterous genera are those called the gall-flies. Those vegetable excrescences, of a globular form, which appear on the leaves and foot-stalks of the oak at particular seasons of the year, and which in autumn have acquired the size of a cherry or a small plum, its color a bright red, and forming a pleasing contrast with the verdure of the leaves, are the habitations formed by the punctures of the gall-fly, in which the eggs were deposited, each singly in its globule by the parent, and each of those excrescences at this season, on being opened, will be found to contain a larva; a small worm of a cylindrical form and without feet. An amazing number of species of this fly (cynips) construct their dwellings, and subsist on the juices of the oak; many others attack in like manner the maple and the willow. The larva is found in a cavity in the centre of each excrescence, in the shape of a small nucleus.

3. The insect advancing from its larva to its pupa state ceases eating; fixes itself in a secure place; and now its skin separates once more, and discloses an oblong body. In this state most insects eat no food; are incapable of locomotion; and if opened seem filled with a watery fluid, in which no distinct organs can be traced. Externally, however, the shape of the pupa of different tribes varies considerably, and different names have been applied to them. Those of the beetle and bee tribes are covered with a membraneous skin, enclosing in separate and distinct sheaths the external organs, as the antennæ, legs, and wings, which are consequently not closely applied to the body, but have their form for the most part clearly distinguishable. To these Aristotle originally gave the name of *nymphæ*, which was continued by Swammerdam and other authors prior to Linné, who calls them *incomplete* pupæ, and has been adopted by many English writers on insects.

Butterflies, moths, and some of the two-winged tribes are in their pupa state also enclosed in a similar membranous envelope; but their legs, antennæ, and wings, are closely folded over the breast and sides; and the whole body enclosed in a common case or covering of a horny consistence, which admits a much less distinct view of the organs beneath it. As these pupæ are often tinged of a golden color, they were called from this circumstance *chrysalides* by the Greeks, and aureliæ by the Romans, both which terms are in some measure become Anglicised; and, though not strictly applicable to ungilded pupæ, are still often given to those of all lepidopterous insects. It is these which by Linné are denominated *obtected* pupæ.

We have observed that most insects eat no food in the pupa state. This qualification is necessary because a considerable number (the tribe of locusts, cockroaches, bugs, &c.) not only greatly resemble the perfect insect in form, but are equally capable with it of eating and moving. As these insects, however, cast their skins at stated periods, and undergo changes, though slight, in their external and internal conformation, they are regarded also as being subject to metamorphoses. These pupæ may be subdivided into two classes; first, those comprised, with some exceptions, under the Linnæan *aptera*, which

in almost every respect resemble the perfect insect, and were called by Linné *complete* pupæ; and secondly, those of the Linnæan order *hemiptera*, which resemble the perfect insect, except in having only the rudiments of wings, and to which the name of *semi-complete* pupæ was applied by Linné, and that of semi-nymphs by some other authors. There is still a fifth kind of pupæ, which is not, as in other instances, excluded from the skin of the larva, but remain concealed under it, and were hence called by Linné *coarctate* pupæ. These, which are peculiar to flies and some other dipterous genera, may be termed *cased nymphs*. When, therefore, we employ the term *pupa*, we may refer indifferently to the third state of any insect, the particular order being indicated by the context, or an explanatory epithet. The terms *chrysalis* (dropping *aurelia*, which is superfluous), *nymph*, *semi-nymph*, and *cased-nymph*, on the other hand, definitely pointing out the particular sort of pupa meant: just as in botany, the common term pericarp applies to all seed-vessels, the several kinds being designated by the names of capsule, silicule, &c. The envelope of *cased-nymphs*, which is formed by the skin of the larva, considerably altered in form and texture, may be conveniently called the puparium; but to the artificial coverings of different kinds, whether of silk, wood, or earth, &c., which many insects of the other orders fabricate for themselves previously to assuming the pupa state, and which have been called by different writers, *pods*, *cods*, *husks*, and *beans*, I shall continue the more definite French term *cocon*, anglicised into *cocoon*. After remaining a shorter or longer period, some species only a few hours, others months, others one or more years, in the pupa state, the enclosed insect now becomes mature in all its parts, bursts the case which enclosed it, quits the pupa, and enters upon the fourth and last state.

4. We now see it (unless it be an apterous species) furnished with wings, capable of propagation, and often under a form altogether different from those which it has previously borne—a perfect beetle, butterfly, or other insect. This Linné termed the *image* state, and the animal that had attained to it the *imago*, because, having laid aside its *mask*, and cast off its *swaddling-bands*, being no longer disguised or confined, or in any respect imperfect, it is now become a true representative or *image* of its species. This state is in general referred to when an insect is spoken of without the restricting terms larva or pupa.

'Strictly,' says Mr. Kirby, 'these [metamorphoses] ought rather to be termed a series of developments. A caterpillar is not, in fact, a simple but a compound animal, containing within it the germe of the future butterfly, enclosed in what will be the case of the pupa, which is itself included in three or more skins, one over the other, that will successively cover the larva: as this increases in size these parts expand, present themselves, and are in turn thrown off, until at length the perfect insect, which had been concealed in this succession of masks, is displayed in its genuine form. That this is the proper explanation of the phenomenon has been satisfactorily proved by Swammerdam, Malpighi, and other anatomists. The first mentioned illustrious naturalist discovered, by accurate dissections, not only the skins of the larva and of the pupa, incased in each other, but within them the very butterfly itself, with its organs indeed in an almost fluid state, but still perfect in all its parts. Of this fact we may convince ourselves without Swammerdam's skill, by plunging in vinegar or spirit of wine a caterpillar about to assume the pupa state, and letting it remain there a few days for the purpose of giving consistency to its parts; or by boiling it in water for a few minutes. A very rough dissection will then enable us to detect the future butterfly; and we shall find that the wings, rolled up in a sort of cord, are lodged between the first and second segment of the caterpillar; and the antennæ and trunk are coiled up in front of the head; and that the legs, however different their form, are actually sheathed in its legs. Malpighi discovered the eggs of the future moth in the chrysalis of a silk-worm only a few days old, and Reaumur those of *bombyx dispar*, even in the caterpillar, and that seven or eight days before its change into the pupa. A caterpillar, then, may be regarded as a loco-motive egg, having for its embryo the included butterfly, which after a certain period assimilates to itself the animal substances by which it is surrounded; has its organs gradually developed; and at length breaks through the shell which encloses it. Swammerdam, whose observations have proved that the analogy is not so complete as had been imagined, speaking of the metamorphosis of insects, uses these strong words:—'This process is formed in so remarkable a manner, in butterflies, that we see therein the resurrection painted before our eyes, and exemplified so as to be examined by our hands.' 'The parallel holds perfectly,' contends Mr. Kirby, 'between the insect and the *man*. The butterfly, the representative of the soul, is prepared in the larva for its future state of glory; and if it be not destroyed by the ichneumons and other enemies to which it is exposed, symbolical of the vices that destroy the spiritual life of the soul, it will come to its state of repose in the pupa, which is its Hades; and at length, when it assumes the *image*, break forth with new powers and beauty, to its final glory and the reign of love. So that in this view of the subject well might the Italian poet exclaim:—

> 'Non v'accorgete voi, che noi siam' vermi
> Nati a formar l'angelica farfalla?'

## PART III.

### CLASSIFICATION OF INSECTS; INCLUDING THEIR MORE PARTICULAR DISTINCTIONS.

#### ORDER I. COLEOPTERA.

The coleoptera order (from κολεος, a sheath and πτερον, a wing,) consists of insects whose elytra or wing-cases are hard or crustaceous, and meet with a longitudinal division down the centre of the back. The wings are mostly two in number. The mouth is closed above by the clypeus, and below by the lips. It is generally furnished with two mandibles, two jaws, and from two to six palpi or feelers. The feet are six

in number and perfect, but in the antennæ is the greatest diversity in shape and formation; the skin is hard and horny, and on each side are nine spiracula: one on the thorax and eight on the abdomen.

The larvæ have six feet near the head, two eyes, often short antennæ, and two jaws; the shape of the head is various, but they have always nine spiracula. In the larger genera this state is retained for three or sometimes four years, but they mostly change into the pupa in twelve or fourteen months. The rapidity of their movements depends on their food; those that devour the roots of plants, &c., are the slowest, those which make living animals their food the swiftest. After having remained in the pupa state for from six weeks to as many months, the skin bursts and the perfect insect appears.

The genera of this order may be conveniently arranged into the following classes: 1. Those with their antennæ clavated. 2. With the antennæ filiform. And 3. With the antennæ setaceous. The first comprises the scarabæus, lucanus, dermestes, hister, byrrhus, gyrinus, attelabus, curculio, silpha, and coccinella. The second class consists of the bruchus, casseda, ptinus, chrysomela, hispa, meloe, tenebrio, lampyris, mordella, and staphylinus. The third contains the cerambyx, leptura, cantharis, elater, cicindella, buprestes, dytiscus, carabus, necydalis, and forficula.

Class I.—*Antennæ clavated, or club-shaped.*

Genus 1. *Scarabæus.*—Gen. char. antennæ club-shaped, the club lamellated; palpi four; mandibles corneous, seldom having teeth; feet six, having the second joint of the first pair commonly dentated. Of this species upwards of eighty are found in this country. Of the species the most remarkable is the S. Hercules: it measures sometimes five or six inches in length; the elytra have a smooth surface, of a bluish-gray color; sometimes nearly black, marked with several black spots of different sizes; the head and limbs are coal-black. From the upper part of the thorax proceeds an enormous horn, sharp at the tip, where it curves slightly downwards, marked beneath by two or three denticulations, and furnished with a fine velvet-like pile: from the front of the head proceeds also a strong horn, about two-thirds the length of the former. This species is a native of South America, where great numbers are said to be sometimes seen on the tree called the mammæa, rasping the rind off the slender branches by working nimbly round them with the horns, till they cause the juice to flow, which they are said to drink to intoxication. The female is destitute both of the frontal and thoracic horn, but in other points she resembles the male.

Another well known species is the S. melolontha, the cockchaffer; of this species the head is testaceous, the thorax hairy, the tail inflected and with a triangular white spot at each incisure of the abdomen. This insect generally makes its appearance in May, and is most plentiful on the hawthorn. It has sometimes been seen in such prodigious quantities as almost to strip the trees of their foliage, and to produce mischiefs approaching the devastations occasioned by the locust tribe. In 1688 swarms were brought by a south-west wind to Galway in Irela[nd]. Thence they penetrated into the inland pa[rts] about twelve miles north of Galway, and [...] and there in the adjacent country appear[ed] among hedges in the day-time, hanging by [the] boughs in clusters. In this posture they con[ti]nued during the heat of the sun; but toward[s] evening they would disperse and fly about with a humming noise, and in such vast numbers that they darkened the air for the space of two or three miles square. Persons travelling on the roads, or abroad in the fields, found it very uneasy to make their way through them, as they would strike against their faces in their flight with such force as to make the place smart, and leave a slight mark behind them. In a short time they had so entirely destroyed all the leaves of the trees, that the whole country, though in the middle of summer, was left as bare as in the depth of winter; and the noise they made in gnawing the leaves made a sound much resembling the sawin[g] of timber.

The most beautiful of the scarabæus genus i[s] the S. Auratus; common in England in the hottes[t] parts of summer. It is about the size of a common garden beetle, but of a flatter shape, and o[f] the most beautiful brilliant golden green color, the elytra being striped towards their points by three or four slight white streaks; its larva is commonly found in the hollows of old trees, and sometimes in the earth of ant-hills. It remains three years before it changes to a pupa, out of which the insect emerges in a short time.

Genus 2. *Lucanus.*—Gen. Char. antennæ, club-shaped, club-perfoliate, jaws prominent and dentated, feet the second joint of the last pair dentated, the body oblong. The principal species is the L. cervus, or stag-beetle. Jaws bifurcated at the tip with many internal teeth. This is the largest of the European coleoptera, sometimes measuring two inches and a half in length. Its general color is a deep chestnut, the thorax, head, and jaws, are of a deeper and brighter color, the legs and under parts raven black, and the true wings of a pale brown. This remarkable insect is chiefly found in oak plantations, delighting in the honey-dew, so frequent on the leaves of that tree. The commonly supposed female appears so different from the male, that it has by some authors been considered as a distinct species. It is not only smaller, but totally destitute of the long jaws; instead of which it has a pair of very short curved ones; the head is also of considerably smaller diameter than the thorax.

Genus 3. *Dermestes.*—Antennæ club-shaped, club-perfoliate, the three end joints longer than the rest, thorax convex, and but slightly marginated, head bending inward, and partly covered by the breast. Gmelin divides the dermestes genus into two families; the first including those with the jaw bifid, the second such as have the jaw armed with a single tooth. The insects of this genus, as well as of the hister and byrrhi, if touched, contract their legs and antennæ and counterfeit death. The larvæ feed on decayed animals, and are very injurious to meat, skins, furs, and even to books. But the species most tremendous in its ravages is the bostrychus typographus of Fabricius in its larva state. It feeds on

soft inner bark of trees, but attacks them in .. vast numbers, that 80,000 are sometimes hid in a single tree, and though the bark be tered, and the trees immessed in snow-water, remains unhurt in its burrowed habitation. e tree attacked by these insects first becomes low-leaved, then the boughs perish at the top, l the tree itself soon dies entirely. This insect is most common in Germany, and the Hartforests show incontrovertible proofs of its destructiveness. In 1665 it was peculiarly prevalent, and in 1783 the trees destroyed were at least 1,500,000 in these forests alone. The mines were stopped for want of a supply of wood, and the inhabitants threatened with consequent ruin. Happily, however, cold and moist seasons destroyed this tremendous pest, and till 1796 they were comparatively few. They then, however, recommenced their attacks, and threatened devastation to the few fir trees that were left.

Genus 4. *Hister.*—Antennæ club-shaped, club solid, bottom joint compressed and bent, head drawn under the thorax, wing-cases shorter than the body, feet the second joint of the first pair dentated. The insects of this species are generally found in dung.

Genus 5. *Byrrhus.*—Antennæ shorter than the thorax, and gradually thickening towards the top, which is compressed: palpi, short and somewhat ovate, the last joint thick and long, body somewhat ovate, and convex above: scutellum minute. They are found in sand-pits, &c., in the summer, when they are very common. Species 1. B. pilula, a brown insect with black interrupted striæ. Fabricius has distinguished a portion of this genus as the anthienus, which is thus described:—Antennæ shorter than the thorax; club sold; palpi filiform short; body orbiculate ovate; scutellum very minute; maxillæ and lip bifid. These insects are generally found on flowers, and though small, are handsomely colored. The larvæ prey on carcases, skins, and dried animal substances, and they remain in this state nearly twelve months. The perfect insects are seen in the spring. Species 1, anth. scrophulariæ black; thorax and sides grey; elytra three gray transverse bands, suture and margin red-lutescent.

Genus 6. *Gyrinus*—Antennæ cylindrical and very short; jaws horny and acute; eyes so divided as to appear as four; four hind feet compressed for swimming. The principal species, G. natator, commonly known as the whirl-beetle, is found running swiftly on the surface of stagnant water, and frequently sinking against one another in the circles it so swiftly describes. They are always found in company with several others of their own species, wheeling round and round with the greatest rapidity, seeming to form assemblies for the purpose of enjoying their 'mazy dance' in the warm sun-beams. If you approach too near, they quickly dive, carrying with them a bubble of air, which appears in the water like quicksilver. When caught, they emit a rancid smell that infects the fingers for a considerable time; but no other species of the gyrinus has this property. The larva is furnished on each side of every abdominal ring with a long, slender, hairy, acute process of the substance of the ring, through which an air-tube winds; the last ring but one has four of these pipes, and longer than the rest. These are its respiratory organs.

Genus 7. *Attelabus.*—Antennæ moniliform, thickest at the top; head inclined, and acuminated behind. A. betuleti, is found on the hazel, the leaves of which are rolled up by the larva into a cylinder. The anatomy of this species is curious; the alimentary canal is moderately long, the stomach shaggy, and the small intestine claviform inversely: there is no gizzard, but there are three pairs of bile vessels. See ATTELABUS in the body of the work.

Genus 8. *Curculio.*—Antennæ club-shaped, situated on the rostrum; feelers four, filiform. Several of this species, particularly C nebulosus, are difficult to procure, on account of their resemblance to the bodies on which they may be found: the C. nebulosus by its gray color, spotted with black, so nearly resembling the earth, is seldom taken. See CURCULIO.

Genus 9. *Silpha.*—Antennæ various, sometimes thickening by degrees, at other times terminated by a solid or perfoliate club; wing-cases covering most of the abdomen, marginated; body oval. The insects of this genus feed on dead carcases and excrements, whence they have a fœtid smell, and when taken discharge a black liquor of a most disgusting kind, and which greatly accelerates putrefaction. The larvæ live entirely on the earth, generally near dung-hills and dead carcases.

The most noted species is S. vespillo, the color of which is black; the wing-sheaths considerably shorter than the abdomen, marked by two ferruginous transverse bars; the general length of the animal is about three-quarters of an inch. The vespillo seeks out some decaying animal substance in which it may deposit its eggs, and, in order to their greater security, contrives to bury it under ground Three or four of these insects, working in concert, have been known to bury the body of a mole in the space of an hour, so that not a trace of it has appeared above ground. They scoop out the earth all round and below the animal which thus gradually sinks down, and while the grave-diggers are invisible, we nevertheless see the body carefully and silently interred. The eggs are white, and of an oval shape; the larvæ, when full grown, are about an inch long, of a yellowish-white color, with an orange-colored bar, across the middle of each ring. Each of these larvæ forms for itself an oval cell in the ground, in which it changes to a yellowish chrysalis or grub, out of which, in about three weeks, proceeds the perfect insect. Fabricius has divided this genus into the sylpha, nitidula, and opatrum. The nitidula he describes as having clavated antennæ; club solid; wing-cases marginated; head prominent; thorax marginated and flat. The species of this genus are numerous, subject to great variety, and therefore require minute examination.

The opatrum is thus described: antennæ moniliform, thickening towards the tip; wing-cases marginated · head prominent; thorax marginated

and flat. The insects of this genus are found in sandy situations in May, June, and July.

Genus 10. *Coccinella*.—Antennæ club-shaped; club solid, the palpi maxillary, and terminated by a large hatchet-shaped joint; body hemispherical; breast and wing-cases marginated; abdomen flat. This is the genus commonly known by the name of the lady-bird. So great is the variety of species in this genus, that on close examination scarcely three specimens will be found alike. Small as are these insects, they are difficult to destroy; without injuring their shape and beauty, they will bear a long immersion in spirits, and though they appear dead, will afterwards recover. 'One morning,' says Mr. Kirby, 'I observed on my study window a little lady-bird, yellow with black dots (coccinella twenty-two punctata L.) You are very pretty, said I to myself, and I should like to have a collection of such creatures. Immediately I seized my prey, and not knowing how to destroy it, I immersed it in geneva; leaving it in this situation a day and a night, and seeing it without motion, I concluded it was dead, and laid it in the sun to dry. It no sooner, however, felt the warmth than it began to move, and afterwards flew away. From this time I began to attend to insects.' The larvæ of this genus feed chiefly on the aphides or plant-lice, and are very serviceable in clearing vegetables of the myriads with which they are often infested.

'As the locust-eating thrush,' says Mr. Kirby, 'accompanies the locusts, so the coccinella seems to pursue the aphides; for I know no other reason to assign for the vast number that are sometimes, especially in the autumn, to be met with on the sea-coast, or the banks of large rivers. Many years ago those of the Humber were so thickly strewed with the common lady-bird (C. septem punctata, L.) that it was difficult to avoid treading upon them. Some years afterwards, I noticed a mixture of species, collected in vast numbers on the sand-hills on the sea-shore, at the north-west extremity of Norfolk. My friend, the Rev. Peter Lathbury, made, long since, a similar observation at Oxford, on the Suffolk coast; and about five or six years ago they covered the cliffs, as I have before remarked, of all the watering places on the Kentish and Sussex coasts, to the no small alarm of the superstitious, who thought them forerunners of some direful evil. These last probably emigrated with the aphides from the hop-grounds. Whether the latter and their devourers cross the sea, has not been ascertained; that the coccinellæ attempt it, is evident from their alighting upon ships at sea, as I have witnessed myself.'

Genus 11. *Tritoma, Fabr.*—Antennæ clavated; club perfoliate; lip emarginate, anterior; palpi hatchet-shaped; body greatly raised; thorax flat.

Of this genus there is but one British species T. bipustulatum, which inhabits fungi; the color is black, with a scarlet ring on the shoulder of the wing-cases.

Class II.—*Antennæ filiform, or of equal thickness throughout.*

Genus 1. *Bruchus*.—Antennæ filiform; palpi filiform and equal; lip pointed. This genus is very destructive to peas, particularly at a late period of their growth; indeed, so perseveringly laborious is the female, that she will frequently deposit an egg in every pea of the pods she visits, and thus entirely destroy them. In this country, their numbers being small, the damage is seldom very considerable; but in North America the bruchus pisi commits the most alarming ravages, so as, in some instances, to destroy all hopes of a crop. 'No wonder then,' observes Mr. Kirby, 'that Kulm should have been thrown into such a trepidation upon discovering some of these pestilent insects in a parcel of peas he had brought over from that country, lest he should be the instrument of introducing so fatal an evil into his beloved Sweden. In 1780 an alarm was spread in some parts of France, that the people had been poisoned by eating worm-eaten peas, and they were, therefore, forbidden to be sold, but the fears of the public were removed by the discovery that it was a species of bruchus that had bored the peas. Another species, B. pecticornis, devours the peas in China and Barbary, and a leguminous seed, much used when boiled as food for horses in India, known to Europeans by the name of gram, but in the Tamul dialect called koloo, and by he Moors cooltee, is the appropriate food of a fourth kind of bruchus, related to the last, but having the antennæ, which in the male are pectinated, much shorter than the body. This is perhaps B. scutellaris, of Fabricius. A parcel of this seed brought over to this country by captain Green was filled with the insect, and several of the grains contained two or more of the larvæ. The plant appears to be a kind of phaseolus, from the peculiarity of the foliage.'

Genus 2. *Cassida*.—Antennæ moniliform; wing-cases and thorax marginated; head mostly covered by the thorax; body gibbous above, flat and marginated beneath. Of this genus there are several British specimens, whose colors, though brilliant and beautiful in the live insect, fade, and in some instances totally disappear after its death. The larvæ of these insects are peculiar for their Hottentot habit of covering themselves from the rays of the sun, and probably from the birds, by a parasol formed of their own excrements, and they are also furnished by nature with an apparatus, by means of which they can raise or drop their cove at their convenience. The instrument by which they effect this, says Mr. Kirby, is an oval fork, upon which they deposit their excrement, and which is sometimes turned up, and lies flat upon their backs; at others forms different angles, from very acute to very obtuse, with their body; and occasionally is unbent, and in the same direction with it. Its anus is remarkably situated, being on the back of the last segment of the body, and not at or under its extremity, as obtains in most insects. By means of such a position, the excrement, when it issues from the body, instead of being pushed away and falling, is lifted up above the back in the direction of the head. When entirely clear of the passage, it falls, and is retained, though slightly, by its viscosity. The

grub next, by a movement of its segments, conducts it from the place where it fell, to the vicinity of the head. It effects this by swelling the segment on which the excrement is deposited, and contracting the following one, so that it necessarily moves that way. Although, when discharged, it has a longitudinal direction, by the same action of the segments the animal contrives to place every grain transversely. Thus, when laid quite bare, it will cover itself in about two hours. There are often many layers of these grains upon the back of the insect, so as to form a coat of greater diameter than its body. When it becomes too heavy and stiff, it is thrown off, and a new one begun. The cassida bidens is remarkable for two curious horns, one within another, that rise perpendicular from the centre of the sutures of the elytrum, and this give a very peculiar appearance to the creature.

Genus 3. *Ptinus.*—Antennæ filiform, the last joints slightly larger; thorax nearly round, not marginated; head partly concealed by the thorax. The genus Ptinus, like that of dermestes, consists of small insects, which, in general, have similar habits, living both in their larva and complete state among dry animal substances, and some species of dry wood, committing much havock among the older articles of furniture, which they pierce with innumerable holes, thus causing a slow but gradual destruction. Mr. Curtis found the grub of the ptinus fur in a coat, which it alone had nearly destroyed, making holes and channels in all parts of it; and Linné tells us, that they will sometimes entirely deprive a fur of its hair. A remarkable property of this genus is, that, though their food is of so dry a nature, their bodies are always full of juices. A beam of oak, according to Messrs. Kirby and Spence, when it has supported the roof of a castle 500 years, is as much to their taste as the soft inner bark to the more epicurean dermestes, and they would sooner feast on the herbarium of Brunsfelsus than on the greenest herbs that grow. The grub of the ptinus will feed for months on a chair that has been baked before the fire for half a century, and from which the chemist's retort could scarcely extract a drop of moisture, and will yet have its body as well filled with fluids as that of a leaf-fed caterpillar. To this genus belong the well known death-watch, the ptinus fatidicus of Linné, the anobium tesselata of Fabricius. It is chiefly in the advanced state of spring that this alarming little animal commences its sound, which is no other than the call or signal by which the male and female are led to each other, and which may be considered as analogous to the call of birds; though not owing to the voice of the insect, but to its beating on any hard substance with the shield or fore-part of its head. The prevailing number of distinct strokes which it beats, is from seven to nine, or eleven: which very circumstance may perhaps add, in some degree, to the curious character which it bears among the vulgar. These sounds or beats are given in pretty quick succession, and are repeated at uncertain intervals: and in old houses, where the insects are numerous, may be heard at almost every hour of the day; especially if the weather be warm. The sound exactly resembles that which may be made by beating moderately hard, with the nail on the table. The insect is of a color so nearly resembling that of decayed wood, viz. an obscure grayish brown, that it may for a considerable time elude the search of the enquirer. It is about a quarter of an inch in length, and is moderately thick in proportion, and the wing-shells are marked with numerous irregular variegations of a lighter or greyer cast than the ground-color. Ridiculous, and even incredible as it may appear, it is an animal that may in some measure be tamed; at least it may so far be familiarised as to be made to beat occasionally, by taking it out of its confinement, and beating on a table or board, when it will readily answer the noise, and will continue to beat as often as required.

We must be careful not to confound this animal, which is the real death-watch of the vulgar, emphatically so called, with a much smaller insect, of a very different genus, which makes a sound like the ticking of a watch, and continues it for a long time without intermission. It belongs to a totally different order, and is the termes pulsatorium of Linnæus.

Genus 4. *Chrysomela.*—Antennæ moniliform; palpi six; thorax marginated, but not the elytra; body ovate. The insects of this genus are noted for their shining and splendid colors, they live principally on leaves, but do not eat the nerves or fibres. Their larvæ are in general of an oval shape, somewhat elongated and soft, with six feet near the head. In the larva state they also feed on the leaves of trees and plants, the pulp and tender parts of which they devour, rejecting the fibres; some kinds infest the cotyledons only, and are very destructive. In the perfect state, they are found chiefly in woods and gardens. Many of these insects are slow in motion, but some kinds have the posterior legs formed for leaping, and some of them, when caught, emit an oily liquor of a disagreeable smell. See CHRYSOMELA in the body of this work.

Insects of this genus mostly ascend plants by means of the cushions of hair with which the underside of the joints of their tarsi is covered, and the C. tenebricosa (bloody-nosed beetle), and the C. goellingensis, will, with these curious supporters, walk with their back downwards, thus supporting themselves against the attraction of gravity. One of the most remarkable species is the C. populi, having the body ovate; thorax bluish; elytra red, tipped with black. This insect inhabits Europe generally, and destroys the leaves of the ash and poplar. But the most remarkable peculiarity is exhibited by the larva, which is varied with black and white, and furnished with very peculiar scent organs. 'On each of the nine intermediate dorsal segments of its body, is a pair of black elevated conical tubercles, of a hard substance; from all of which, when touched, the animal emits a small drop of a white milky fluid, the smell of which, De Geer observes, is almost insupportable, being inexpressibly strong and penetrating; and, as the drops proceed at the same instant from all the eighteen horns, they form a curious spectacle. The insect, however, does not waste this pre-

cious fluid; each drop, instead of falling, after appearing for a moment, and dispensing its perfumes, is withdrawn again within its receptacle till the pressure is repeated, when it reappears.' Kirby and Spence, vol. ii. 246. From this genus Fabricius separates the genus CRYPTOCEPHALUS, which see.

Genus 5. *Hispa.*—*Antennæ* cylindrical, approximate at the base, and seated between the eyes, *palpi* fusiform, *thorax* and *elytra* spinous generally.

Most of the hispa genus are natives of extra European climates; those found in Europe occur in the winged state on the leaves and roots of different kinds of grass; their larvæ and transformations are unknown.

The four species of the hispa tribe known to Linnæus, were atra, testacea, sanguiniollis, and mutica, the last of which was not however then considered as appertaining to that genus, being referred by Linnæus to the dermestes family, under the specific name of clavicornis. This is however now replaced with the *hispa*, and the number of species is about twenty-five.

Genus 6. *Meloe.*—*Antennæ* moniliform, *thorax* nearly round; *elytra* soft, flexible, and shorter than the abdomen; *head* inflected and gibbous.

This genus is mostly found in spring, feeding on the ranunculus, or in open sandy fields, and its ova have an agreeable smell. This tribe is found from Sweden and Spain to Russia, and the shores of the Mediterranean. Of registered species, Britain possesses the largest proportion; but there are thought to be more in Spain. The most remarkable species is the meloe proscarabæus (oil-beetle), having deep yellow drops of an animal oil at all its joints. As these insects feed upon acrid plants, such as the crowfoot or ranunculus, it is probable that this fluid partakes of the nature of their food, and is very acrimonious, and thus may put to flight its insect assailants or the birds, from neither of which it could otherwise escape, being a very slow and sluggish animal. The larvæ of this insect are said to be parasitical, upon the authority of De Geer. He observed, according to Mr. Kirby, the insect deposit in the earth one or two considerable masses, containing an infinite number of very minate orange-colored eggs, adhering to each other, which in about a month were hatched, and produced a number of small hexapods, distinguished by two pairs of anal setæ and a proleg, by means of which they could move readily upon glass, as I have myself seen: these little animals precisely corresponded with one found by the latter author upon *syrphus intricaria*; and, when that fly was placed amongst them, they immediately attached themselves to it, so as to leave no doubt of their identity. A congenerous species had been detected upon wild bees, and described by Linné under the name of *pediculus apis*. De Geer is so thoroughly to be depended upon, for his veracity and accuracy of observation, that we cannot suppose there is any incorrectness in his statement. If the mass of eggs be, as he represents it, of the size of a hazel nut, it must have been the product of a very large insect: in confirmation of this opinion it may be further observed, that the larva of the kindred genus *cantharis* Lat. agrees with it in having anal setæ, though it appears to differ in having only two conspicuous segments in the trunk. Those which infest wild bees, make their first appearance upon acrid plants, which the *meloe* likewise feeds upon, from whence with wonderful agility they leap upon the andrenæ that visit these flowers. Still however, it is so contrary to the analogy of nature for the larva of the great beetle to feed on the little bee, and that these creatures should be for the first part of their lives fed on insects, and afterwards on animal food, that it is much to be wished that some skilful insect-anatomist would carefully dissect the *meloe*; or, perhaps by digging round the roots of the ranunculuses and other acrid plants, the larva of that beetle might be discovered in a late stage of growth, and so this mystery be cleared up.

This genus is distinguished by Fabricius from the *notoxus* and *lytta*, and in this arrangement he is followed by Dr. Marsh; indeed the improvements of the writer first named, as noticed in this treatise, are almost universally adopted by the adherents to the Linnæan system.

The *notoxus* is thus described:—*antennæ* filiform; *feelers* four, securiform; jaws having one tooth each. N. monoceros is remarkable as having the *thorax* projecting like a horn over the head. It may be often seen buzzing about the sea shores of Wales.

The characters of the lytta are *antennæ* filiform; *feelers* four; the hind pair elavated; *thorax* round; *head* bent down and gibbous; *wing-cases* soft and flexible. The well-known blistering fly (lytta vesicatoria) belongs to this genus. See LYTTA.

Genus 7. *Tenebrio.*—*Antennæ* moniliform, last joint round; *thorax* slightly convex and marginated; *head* standing out; *elytra* somewhat rigid. A well-known species is T. molitor, which is entirely black; *thighs* anterior thick; an insect often seen in houses, proceeding from a larva commonly known by the name of meal-worm, from its being so frequently found in flour, &c.; it is of a yellowish-white color, about an inch long, slender-bodied, and of a highly-polished surface, and is considered as the favorite food of the nightingale, in its captive state, and said to remain two years before it changes into a chrysalis. The meal-worm, though its usual food is flour, has been voided both by male and female patients; and, in one instance, is said to have occasioned death. How these grubs should get into the stomach it is difficult to say, perhaps the eggs may have been swallowed in some preparation of flour. But that the animal should have been able to sustain the heat of that organ, so far exceeding the temperature to which it is usually accustomed, is the most extraordinary circumstance of all.

From this genus Fabricius has distinguished the BLAPS, which he thus defines:—*Antennæ* filiform; *palpi* four; *thorax* slightly convex, and marginated; *head* standing out; *wing-cases* somewhat rigid; wings mostly wanting. The most noted species is the blaps-mortisaga. It is a coal-black insect, measuring about an inch in length, of rather slow motion, and distinguished by the remarkably pointed appearance of the

undivided wing-sheaths, which at their extremities project a little beyond the abdomen; and the insect is totally destitute of real, or under wings. It is usually found in dark neglected places, beneath boards, in cellars, &c., and, if handled, especially if crushed, diffuses a very unpleasant smell. Pliny represents this beetle, when applied with oil extracted from the cedar, as an infallible remedy for otherwise incurable ulcers.

Genus 8. *Lampyris.*—*Antennæ* filiform; *feelers* four; *wing-cases* flexible; *thorax* flat semi-orbicular; *head* concealed under the thorax; *abdomen* sides having papillary folds, the females mostly destitute of wings, and resembling larvæ.

The *lampyris noctiluca*, or glow-worm, is a highly curious and interesting animal. It is seen during the summer months as late as the close of August, if the season be mild, on dry banks, about woods, pastures, and hedgeways, exhibiting, as soon as the dusk of the evening commences, the most vivid and beautiful phosphoric splendor, in form of a round spot of considerable size. The animal itself, which is the female insect, measures about three-quarters of an inch in length, and is of a dull earthy-brown color on the upper parts, and beneath more or less tinged with rose-color; with the two or three last joints of the body of a pale, or whitish-sulphur color. It is from these parts that the phosphoric light above-mentioned proceeds, which is of a yellow color, with a very slight cast of green: the body, exclusive of the thorax, consists of ten joints or divisions. The larva, pupa, and complete female insect scarcely differ perceptibly from each other in general appearance, but the phosphoric light is strongest in the complete animal. The glow-worm is a slow-moving insect, and in its manner of walking frequently seems to drag itself on by starts, or slight efforts as it were. The male is smaller than the female, and is provided both with wings and wing-sheaths: it is but rarely seen, and it seems, even at present, not very clearly determined whether it be luminous or not. The general idea among naturalists has been that the splendor exhibited by the female in this species is ordained for the purpose of attracting the male. This circumstance is elegantly expressed in the lines of Mr. Gilbert White, in his History of Selburne:—

> The chilling night-dews fall; away, retire.
> For see, the glow-worm lights her amorous fire!
> Thus, ere night's veil had half obscured the sky,
> The impatient damsel hung her lamp on high:
> True to the signal, by love's meteor led,
> Leander hastened to his Hero's bed.

It is certain however that in some species of this genus, the male as well as the female is luminous, as in the L. halica, which is a native of our own country also, though less common than in the more sultry countries of the south. Aldrovandus describes the winged glow-worm as having its wing-shells of a dusky color and at the end of the body two brilliant fiery spots like the flame of sulphur.

In Italy this flying glow-worm is extremely plentiful; and we are informed by Dr. Smith, and other travellers, that it is a very common practice for the ladies to stick them by way of ornament in different parts of their head-dress during the evening hours.

The common or wingless glow-worm may be very successfully kept, if properly supplied with moist turf, grass, moss, &c., for a considerable length of time; and, as soon as the evening commences, will regularly exhibit its beautiful effulgence, illuminating every object within a small space around it, and sometimes the light is so vivid as to be perceived through the box in which it is kept. This insect deposits its eggs, which are small and yellowish, on the leaves of grass, &c.

'Authors who have noticed the luminous parts of the common female glow-worm,' says Mr. Kirby, 'having usually contented themselves with stating that the light issues from the three last ventral segments of the abdomen, I shall give you the result of some observations I once made upon this subject. One evening, in the beginning of July, meeting with two of these insects, I placed them on my hand. At first their light was exceedingly brilliant, so as to appear even at the junctions of the upper or dorsal segments of the abdomen. Soon after I had taken them, one withdrew its light altogether, but the other continued to shine. While it did this it was laid upon its back, the abdomen forming an angle with the rest of its body, and the last or anal segment being kept in constant motion. This segment was distinguished by two round and vivid spots of light, which, in the specimen that had ceased to shine, were the last that disappeared, and they seem to be the first parts that become luminous when the animal is disposed to yield its light. The penultimate and ante-penultimate segments, each exhibited a transverse band of yellow radiance, terminated towards the trunk by an obtusely-dentated line, a greener and fainter light being emitted by the rest of the segment.'

Though many of the females of the different species of *lampyris* are without wings and even elytra (in which circumstance they differ from all other apterous *coleoptera*) this is not the case with all. The female of *L. Italica*, a species common in Italy, is winged; and when a number of these moving stars are seen to dart through the air, in a dark night, nothing can have a more beautiful effect

With respect to the remote cause of the luminous property of insects, continues this interesting writer, philosophers are considerably divided in opinion. The disciples of modern chemistry have in general, with Dr. Darwin, referred it to the slow combination of phosphorus secreted from their fluids by an appropriate organisation; and entering into combination with the oxygen supplied in respiration. This opinion is very plausibly built upon the ascertained existence of phosphoric acid as an animal secretion; the great resemblance between the light of phosphorus in slow combustion and animal light; the remarkably large spiracula in glow-worms; and upon the statement that the light of the glow-worm is rendered more brilliant by the application of heat and oxygen gas, and is extinguished by cold and by hydrogen and carbonic acid gases. From these last facts Spallanzani was led to regard the luminous matter as a compound of hydrogen and

carbureted hydrogen gas. Carradori having found that the luminous portion of the belly of the Italian glow-worm (*lampyris Italica*) shone in vacuo, in oil, in water, and when under other circumstances where the presence of oxygen gas was precluded, with Brugnatelli ascribed the property in question to the imbibition of light separated from the food or air taken into the body, and afterwards secreted in a sensible form. Lastly, Mr. Macartney having ascertained, by experiment, that the light of a glow-worm is not diminished by immersion in water, or increased by the application of heat; that the substance affording it, though poetically employed for lighting the fairies' tapers, is capable of inflammation if applied to the flame of a candle or red-hot iron; and when separated from the body exhibits no sensible heat on the thermometer's being applied to it—rejects the preceding hypotheses as unsatisfactory, but without substituting any other explanation; suggesting, however, that the facts he observed are more favorable to the supposition of light being a quality of matter than a substance.

Some experiments made by the Rev. R. Sheppard on the glow-worm are worthy of being recorded. One of the receptacles being extracted with a pen-knife continued luminous; but on being immersed in camphorated spirit of wine, became immediately extinct. The animal, with one of its receptacles uninjured, being plunged into the same spirit, became apparently lifeless in less than a minute; but the receptacle continued luminous for five minutes, the light gradually disappearing. Having extracted the luminous matter from the receptacles, in two days they were healed, and filled with luminous matter as before. He found this matter to lose its luminous property, and become dry and glossy like gum, in about two minutes; but it recovered it again on being moistened with saliva, and again lost it when dried. When the matter was extracted from two or three glow-worms, and covered with liquid gum-arabic, it continued luminous for upwards of a quarter of an hour.'

Mr. Murray remarks that, in a box in which glow-worms were kept, five luminous specks were found secreted by the animal, 'which seemed to glow, and were of a different tinge of light. One put into olive-oil at eleven, P. M. continued to yield a steady and uninterrupted light until five o'clock the following morning, and then seemed, like the stars, to be only absorbed by superior effulgence. The luminous spherical matter of the glow-worm is evidently enveloped in a sac or capsule perfectly diaphanous, which when ruptured discloses it in a liquid form, of the consistency of cream. M. Macaire, he observes, in the *Bibliotheque Universelle*, draws the following conclusions from experiments made on the luminous matter of this animal: that a *certain* degree of heat is necessary to their voluntary phosphorescence—that it is excited by a degree of heat superior to the first, and inevitably destroyed by a higher—that bodies which coagulate albumen take away the power—that phosphorescence cannot take place but in a gas containing no oxygen—that it is not excited by common electricity, but is so by the Voltaic pile—and lastly, that the matter is chiefly composed of *albumen*.

Genus 9. *Mordella.*—*Antennæ* moniliform; *thorax* round; *palpi* four; when frightened it draws its head under the thorax; *elytra* narrower towards their point, slightly curved, and before the thighs is a plate at the base of the abdomen. *M. aculeata* is the most common of the British species, measuring from a quarter to half an inch in length: color entirely black; surface smooth; the abdomen compressed, and terminating in a sharp spine, extending beyond the wing-sheaths: the legs are rather long, and the insect, when disturbed, has the power of leaping or springing to a small distance. It is usually found on plants, in gardens and fields. It is observed to vary occasionally in color, having the wing-sheaths sometimes marked by two transverse, cinereous, bars.

Genus 10. *Staphylinus.*—*Antennæ* moniliform: *feelers* four; *elytra* half as long as the body; *wings* folded up under the elytra; *tail* not armed with a forceps, furnished with two exsertile vesicles. The insects of this genus are extremely rapacious, devouring not only the insects of other genera, but frequently each other. Many of them, when attempted to be caught, turn up the tail. The jaws are very strong, with which they bite and pinch very hard: most of them are found in damp moist places, and a few upon flowers. A well-known species is the black soldier, or *S. murinus*, the color of which is cinereous; abdomen and legs deep black. It is found in this country, among decayed carcases and dung. The shells are blue, and polished beneath. The larva is six-footed, naked, and of a pale hue. The head and three first segments of the abdomen chestnut brown; tail with two jointed bristles, and a cylindrical tubercle beneath. The great rove-beetle, S. olens, presents a striking and rather terrific appearance, when, with its large jaws expanded, and its abdomen turned over its head like scorpion, it menaces its enemies, and thus preserves itself from numerous attacks.

### Class III.—*Antennæ setaceous, or growing gradually thinner from base to point.*

Genus 1. *Cerambyx.*—*Antennæ* setaceous; *palpi* four; *thorax* either spinous or gibbous; *wing-cases* linear. This is a numerous genus, it has therefore been divided into several genera by later writers. The larvæ mostly live in wood, which they perforate and consume, and are the favorite food of the woodpecker. The antennæ of several of this genus are four times their length. In the larva state they are sometimes eaten; in the West Indies these larvæ are collected by the negroes as an article of luxury for the tables of their owners, and are in great esteem. Many of these insects possess a powerful odoriferous smell, similar to that of the European species moschatus. A well-known British species is the C. moschatus. *Color*, shining green; *antennæ* of a moderate size and blue; *thorax* spinous. This insect is found on the willow in European countries, and is generally known in England by the name of goat-chafer, or musk-beetle, which last it merits particularly, the insect emitting a powerful smell of

musk when alive. Length, including the antennæ, about three inches.

Genus 2. *Leptura.—Antennæ* setaceous; *palpi* four, filiform; *wing-cases* sloping off to a point; *thorax* somewhat cylindrical. Most of the leptura genus are furnished with legs of considerable length, and run with much speed and activity; they are found on flowers. A common British species is the L. aquatica, of a fine golden-green color, with the posterior thighs clavated and dentated; the antennæ blackish, with a pale testaceous tint at the joints; head with a line down the middle; thorax grooved; body beneath downy; legs obscure, testaceous. Common in Britain, and other parts of Europe, on aquatic plants, particularly the nymphæa.

Genus 3. *Cantharis.—Antennæ* filiform; *wing-cases* flexible; *abdomen* sides having papillary folds; *thorax* generally marginated. This is an extremely rapacious tribe, preying even on its own kind. C. biguttata is a handsome insect, and is furnished with two red vesicles at the base of the abdomen, and two at the base of the thorax, which are raised or depressed alternately. It is common on various plants in the woods of Britain in the months of May and June.

Genus 4. *Elater.—Antennæ* filiform; *feelers* four, hatchet shaped; *mandibles* notched or bifid at their extremities. These animals having very short legs, when laid upon their backs, says Mr. Kirby, cannot, by their means, recover a prone position. To supply this seeming defect in their structure, Providence has furnished them with an instrument which, when they are so circumstanced, enables them to spring into the air and recover their standing. If you examine the breast (*pectus*) of one of these insects, you will observe between the base of the anterior pair of legs a short and rather blunt process, the point of which is towards the anus. Opposite to this point, and a little before the base of the intermediate legs, you will discover in the after breast (*postpectus*) a rather deep cavity, in which the point is often sheathed. This simple apparatus is all that the insect wants to effect the above purpose. When laid upon its back, in your hand if you please, it will first bend back, so as to form a very obtuse angle with each other, the head and trunk, and abdomen and metathorax, by which motion the mucro is quite liberated from its sheath; and then, bending them in a contrary direction, the mucro enters it again, and, the former attitude being briskly and suddenly resumed, the mucro flies out with a spring, and the insect rising, sometimes an inch or two, into the air, regains its legs, and moves off.

The antennæ are lodged in a cavity, scooped out of the under side of the head and thorax, to preserve them from injury when the insect falls after its singular leap. The larvæ reside in decayed wood. The elater noctilucus, or fire-fly of St. Domingo, is a most remarkable creature. This insect, continues Mr. Kirby, which is an inch long, and about one-third of an inch broad, gives out its principal light from two transparent eye-like tubercles placed upon the thorax; but there are also two luminous patches concealed under the elytra, which are not visible except when the insect is flying, at which time it appears adorned with four brilliant gems of the most beautiful golden-blue lustre: in fact, the whole body is full of light, which shines out between the abdominal segments when stretched. The light emitted by the two thoracic tubercles alone is so considerable, that the smallest print may be read by moving one of the insects along the lines; and in the West India islands, particularly in St. Domingo, where they are very common, the natives were formerly accustomed to employ these living lamps, which they called cucuy, instead of candles, in performing their evening household occupations. In travelling at night they used to tie one to each great toe; and, in fishing and hunting, required no other flambeau. And, according to P. Martire, 'many wanton wilde fellowes' rub their faces with the flesh of a killed cucuius, as boys with us use phosphorus, 'with purpose to meet their neighbours with a flaming countenance,' and derive amusement from their fright.

Genus 5. *Cicindella.—Antennæ* setaceous, *palpi* six, filiform; the posterior ones hairy: *mandibles* projecting with many dents; *eyes* prominent; *thorax* rounded and marginated. These insects are alike noted for their beauty and rapacity, preying, with ravenous ferocity, on all smaller insects that fall in their way. The larva is soft and white, and commonly lurks in a hole, drawing in whatever prey may come near. Species C. campestris green, the *elytra* having five dots, white. Inhabiting sand-pits.

Genus 6. *Buprestis.—Antennæ* serrated, and the length of the thorax; *feelers* four, filiform, with the last joint obtuse and truncated; *head* partly drawn under the thorax. Of all the coleopterous genera there is none the species of which are so generally rich, resplendent, and beautiful, as those of buprestis; and these, in their first state, derive their nutriment from the produce of the forest, in which they sometimes remain for many years before they assume the perfect state, as if, says Mr. Kirby, nature required more time than usual to decorate these lovely insects. The principal species is B. gigantea, the grub of which is ascertained to have existed in the wood of a deal table more than twenty years.

Genus 7. *Dytiscus.—Antennæ* setaceous; *palpi* six, filiform; hind *feet* swimmers, with minute claws. The insects of this genus may be taken in ponds, ditches, &c., at every season of the year; they are therefore very numerous, and deserving of considerable attention. The larvæ of most are furnished with anal appendages or swimmers, but some, not being possessed of such organs, never rise from the bottom. See our article DYTISCUS. From this is derived the genus *hydrophilus*, which is thus described:—*Antennæ* clavated; club perfoliate; hind feet formed for swimming, as the above dytiscus genus. The larvæ of this genus are the crocodiles of the ponds, killing not only insects, but small dace, minnows, &c. The principal species is the hydrophilus piceus, the color of which is black, the sternum channelled and spiny. The only insects certainly known to spin an egg-pouch, like the spiders, are the *hydrophili*. That of the great water-beetle (hydrophilus piceus) was long ago described and figured by Lyonnet; and a more

detailed account of it has since been given by M. Miger, which we extract from Messrs. Kirby and Spence. In form it somewhat resembles a turnip when reversed, since it consists of a pouch of the shape of an oblate spheroid, the great diameter of which is three-quarters of an inch; and the small half an inch, from which rises a curved horn, about an inch long and terminating in a point. The animal is furnished with a pair of anal spinners, which move from right to left, and up and down, with much quickness and agility: from these spinners a white and glutinous fluid appears to issue, that forms the pouch, which it takes the animal about three hours to construct. The exterior tissue is produced by a kind of liquid and glutinous paste, which, by desiccation, becomes a flexible covering, impermeable to water; the second, which envelopes the eggs, is a kind of light down of great whiteness, and keeps them from injuring each other. The tissue of the horn is of a silky nature, porous and shining, and greatly resembling the cocoons of *lepidoptera*. This part, contrary to what Lyonnet supposes, appears calculated to admit the air, the water soon penetrating it when submerged. At its base is the opening prepared for the egress of the larvæ, when hatched, which is closed by some threads, that, by means of the air confined in the cocoon or pouch, hinder the water from getting in. This nidus does not float at liberty in the water till after the eggs are hatched, the parent animal always attaching it to some plant. By means of this anomalous process for a beetle, which this insect is instructed by providence thus to perfect, the precious contents of its little ark are secured from the action of the element which is to be the theatre of their first state of existence, from the voracity of fishes, or the more rapacious larvæ of its own tribe, until the included eggs are hatched, and emerge from their curious cradle.

The larva lives in still waters and ponds, its head is smooth and of a dark brown color, with six feet placed on the back and a tapering tail. In the month of July it attains to its full size, and leaving the water creeps to a heap of dung, and buries itself in a deep hole underneath, lying coiled up in a circle, and thus changing to the chrysalis or pupa state. About the middle of August the perfect insect makes its appearance.

Genus 8. *Carabus.*—*Antennæ* filiform; *palpi* six last joints thick and truncated; *thorax* heart-shaped, truncated at the point, and marginated; *wing-cases* marginated. Mr. Marsham has described 109 British species of this tribe, which are mostly found on the ground, or under stones, &c. The whole of this genus are very voracious, preying on all insects they can overcome; when taken they discharge a brown, fetid, and caustic liquor; many of them want wings, and their larvæ reside in putrid wood, mosses, &c.

One of the most destructive of this species is the C. sycophanta. The grub takes up its station in the nests of bombyx, and fills itself so full that it appears ready to burst.

Another celebrated insect of this tribe is the bombardier, for an account of which, see CARABUS.

Genus 9. *Necydalis.*—*Antennæ* setaceous: *palpi* four, filiform; *wing-cases* smaller than the wings. This genus is generally found in woods in their perfect form; but the larvæ are unknown. In some the thorax is black, in others yellow; the elytra are generally black, and lighter towards the middle, which often contains a yellow, or lemon-colored spot.

Genus 10. *Forficula.*—*Antennæ* setaceous; *feelers* filiform, but unequal; *wing-cases* shorter than the abdomen and cut short off at their tips; *abdomen* armed with forceps. The well known earwig (forficula auricularis) belongs to this genus.

The two sexes differ in the shape and bulk of the abdomen, as well as the forceps at the extremity of the abdomen. The female is distinguished by the superior size of the abdomen. The eggs are large, white, and glossy; and the larvæ, when hatched, considerable in proportion to the magnitude of the egg from which they are excluded. Few of the insect tribe evince more attention to their young than the females of the forficulæ. They are particularly careful to deposit their eggs in places of security, and are often seen sitting on them for hours together; and they are also known to regard the infant brood with tenderness, the young remaining in society with the parent some time after being produced from the egg.

### Order II.—Hemiptera.

Most of the insects of this order are provided with a long beak or rostrum, bent inwards towards the chest; their *wing-cases* are soft, and cross each other with a portion of the anterior margins.

Genus 1. *Blatta.*—*Antennæ* setaceous, *head* bent inward, *feelers* unequal, *wing-cases* flat, *wings* flat and coriaceous, *thorax* flattish and margined, *feet* cursorious, *tail* having two horns on the top. The principal species is the B *orientalis*, originally a native of South America, but now too well known in Europe by the name of the *cock-roach*. It frequents kitchens and all warm parts of a house, and devours all sorts of vegetable provisions. It generally conceals itself in the day time, and runs quickly if discovered, or a light is brought near them. See BLATTA.

Genus 2. *Gryllus.*—*Antennæ* filiform, *head* bent inward and having jaws; *palpi* filiform; *wings* four, deflected and rolled, under pair folded, *hind feet* saltatores, and all furnished with two claws. To this genus belongs the devouring locust, of which we have already treated in the introduction to this treatise, we shall therefore only give the following account of their ravages in Transylvania, Wallachia, Moldavia, Hungary, and Poland, in 1747 and 1748, from the sixty-fourth number of the Philosophical Transactions.

'The first swarms entered into Transylvania in August, 1747: these were succeeded by others, which were so surprisingly numerous that, when they reached the Red Tower, they were full four hours in their passage over that place: and they flew so close that they made a sort of noise in the air by the beating of their wings against one another. The width of the swarm was some hundreds of fathoms, and its height or density may be easily imagined to be more considerable, inasmuch as they hid the sun, and darkened the sky, even to that degree, when they flew low,

that people could not know one another at the distance of twenty paces; but, whereas they were to fly over a river that runs in the valleys of the Red Tower, and could find neither resting-place nor food; being at length tired with their flight, one part of them lighted on the unripe corn on this side of the Red Tower, such as millet, Turkish wheat, &c.; another pitched on a low wood, where, having miserably wasted the produce of the land, they continued their journey, as if a signal had actually been given for a march. The guards of the Red-Tower attempted to stop their irruption into Transylvania by firing at them; and, indeed, where the balls and shot swept through the swarm, they gave way and divided; but, having filled up their ranks in a moment, they proceeded on their journey. In the month of September, some troops of them were thrown to the ground by great rains and other inclemency of the weather; and thoroughly soaked with wet, they crept along in quest of holes in the earth, dung, and straw; where, being sheltered from the rains, they laid a vast number of eggs, which stuck together by a viscid juice, and were longer and smaller than what is commonly called an ant's egg, very like grains of oats. The females having laid their eggs, die, like the silk-worm; and we Transylvanians found by experience, that the swarm which entered our fields by the Red Tower, did not seem to intend remaining there, but were thrown to the ground by the force of the wind, and there laid their eggs: a vast number of which being turned up and crushed by the plough, in the beginning of the ensuing spring, yielded a yellowish juice. In the spring of 1748, certain little blackish worms were seen lying in the fields and among the bushes, sticking together, and collected in heaps. These were neglected entirely, and unnoticed throughout the winter; but the subsequent June discovered what these worms were; for then, as the corn sown in spring was pretty high, these creatures began to spread over the fields, and became destructive to the vegetables by their numbers. Then at length, the country people, who had slighted the warning given them, began to repent of their negligence; for, as these insects were now dispersed all over the fields, they could not be extirpated without injuring the corn. At that time they differed little or nothing from our common grass-hopper, having their head, sides, and back, of a dark color, with a yellow belly, and the rest of a reddish hue. About the middle of June, according as they hatched, sooner or later, they were generally a finger's length, or somewhat longer, but their shape and color still continued. Towards the end of June, they cast off their outward covering, and then it plainly appeared that they had wings, very like the wings of bees, but as yet unripe, and unexpanded; and then their body was very tender, and of a yellowish green; then, in order to render themselves fit for flying, they gradually unfolded their wings with their hinder feet, as flies do; and, as soon as any of them found themselves able to use their wings, they soared up, and by flying round the others enticed them to join them: and thus their numbers increased daily; they took circular flights of twenty or thirty yards square, until they were joined by the rest; and, after miserably laying waste their native fields, they proceeded elsewhere in large troops. Wheresoever these troops happened to pitch, they spared no sort of vegetable: they eat up the young corn and the very grass, but nothing was more dismal than to behold the lands in which they were hatched; for they so greedily devoured every green thing thereon before they could fly, that they left the ground quite bare.'

Genus 3. *Cicada.*—*Antennæ* setaceous; *wings* four, and formed of membrane; *beak* bent inward; *feet* saltatores.

The cicada live on various kinds of plants; the larvæ are entirely destitute of wings, which in the pupa begin to appear; in other respects they resemble the perfect insect. The larvæ discharge a kind of froth from the body, under which they conceal themselves; they are furnished with six feet, and are very active. The males, in general, chirp like the cricket; and some of the larger kinds of the tettigonia possess two peculiar drum-like organs, which emit a loud and incessant noise at the pleasure of the insect, as is particularly exemplified in some of the Chinese and North American cicadæ. The most magnificent species is the C. Indica, the color of which is black, with a yellow stripe, and towards the extremity of the abdomen an orange stripe: elytra brown olive, with red veins. A single species only has been discovered, which was taken in Bengal about ten years ago, and is now deposited in the imperial cabinet of Vienna.

Genus 4. *Notonecta.*—*Antennæ* short; *wings* four, folded across, and coriaceous at the top; *beak* bent inwards; hinder *feet* natatores.

The insects of this genus live in stagnant waters, and prey on aquatic animalcula: the larvæ and pupæ are six-footed and active, the former have the rudiments of wings, the others none. There are seventeen species.

The insects of this genus obtained the name of notonectæ, from the singular manner in which they swim on the back. This situation seems admirably adapted to its feeding, which is on the under sides of plants that grow on the surface of the water; its motions are very nimble, diving down at the instant of alarm, and rising again to the surface when the danger is past; the two hind legs serving for paddles.

Genus 5. *Nepa.*—*Antennæ* short; *wings* four, folded across, and coriaceous inside; *beak* bent inwards; two fore *feet* cheliform; rest cursorii.

When these insects arrive at their full size, they are sometimes nearly an inch in length, and nearly half as broad. The antennæ appear in the place of the fore legs, and are armed with forceps. The nepas are, of all animals, the most tyrannical; like wolves, among a flock of harmless sheep, they destroy a vast number more than their wants require. If a nepa be placed in a basin of water with thirty or forty libellula worms, each as large as itself, it will destroy them all in a very short space of time, getting on their backs, and piercing them through the body with the rostrum.

Genus 6. *Aphis.*—*Antennæ* setaceous, long

*wings* four, or sometimes none; *feet* cursorii; *rostrum* bent inward; *abdomen* armed with two small horns. We have already treated of this destructive and numerous genus in our article Aphis, to that therefore we must refer the reader.

Genus 7 *Cimex.*—*Antennæ* longer than the *thorax*, which is margined; *wings* folded crosswise, the upper ones coriaceous in part; back flat; *feet* cursorii. The insects of this genus mostly feed on the juices of plants, and have all a most disagreeable smell. Both larvæ and pupæ have six feet; the former has no wings, the latter has rudiments of them. The species best known (at least in the metropolis) in England is the C. lectuarius, or bed-bug, which we have already noticed under Cimex and Bug, which see.

Genus 8. *Chermes.*—*Rostrum* seated on the pectus; *antennæ* longer than the thorax; the four *wings* are deflected; *thorax* gibbous; *feet* saltatores. There are twenty-four species, the chief of which are described in our article Chermes.

Genus 9. *Coccus.*—*Antennæ* filiform; the *rostrum* proceeding from the breast; the *belly*, or *abdomen*, bristly behind; the two wings of the male are erect; the female has none. See Coccus in the body of the work.

Genus 10. *Thrips.*—*Rostrum* very small; *antennæ* about the length of the thorax; *abdomen* curved upwards; the four *wings* straight, narrow, and slightly crossed.

The insects of this genus are small, and found mostly on plants and various flowers.—The thrips is highly injurious and destructive to fruit-trees, but particularly the grape or vine. The most effectual method of destroying them is probably that of frequent washing with water, by the engine or otherwise, every evening; as, when performed in the heat of the sun, the vines are materially injured by it. But when the berries begin to color, it is to be wholly discontinued, as after that it destroys the fruit.

Where there is a neglect of washing the trees, the thrips generally makes its appearance. In such cases, these insects may, without much difficulty, be destroyed by the fumigation of tobacco and damp hay; the plants or trees being well washed after it.

## Order III.—Lepidoptera.

The insects of this order are the butterflies and moths, and have all four wings, covered with a kind of scales resembling feathers, and reflecting the most brilliant colors.

Genus 1. *Papilio.*—*Antennæ* club-shaped, gradually; *wings* erect, and meeting upwards; flying only in the day. This numerous and elegant tribe has been tastefully divided into families by Linné in the following manner:—

The first division is formed of *equites*, distinguished by the shape of their upper wings; which are longer if measured from their posterior angle to their anterior extremity, than from the same point to the base. The equites are divided into Troes or Trojans (distinguished by having red or blood-colored spots or patches on each side their breasts) and Achivi, Greeks, without red marks on the breast, and of gayer colors in general than the former.

The second division is formed of *heliconii*, which are distinguished by wings that are narrow and entire, frequently naked or semi-transparent the upper ones oblong, the lower ones very short.

The third division is formed of the *Danai*, so called from the sons and daughters of Danaus They are divided into Danai candidi, which have whitish wings; and Danai festivi, in which the ground-color is never white, and the wings are variegated.

The fourth division is formed of the *nymphales*, distinguished by the edges of the wings being scolloped or indented. It is subdivided into the nymphales gemmati, in which the wings are marked with eye-shaped spots; and nymphales phalerati, without those spots.

The fifth division is formed of the *plebeii* These are commonly smaller than the preceding kinds of butterflies, and are subdivided into rurales and urbicolæ: the wings of the former are marked with obscure spots; those of the latter have for the most part transparent spots.

We shall now give a brief description of a few of the most beautiful species of this elegant tribe.

(1.) *P. brassicæ*, common butterfly. The wings rounded and white; tip of the upper pair brown. It proceeds from a yellowish caterpillar freckled with bluish and black spots, and which changes during autumn into a yellowish-gray chrysalis, affixed in a perpendicular direction to some wall, tree, or other object.

(2.) *P. io*, peacock-butterfly; so called from the peacock's eyes which it bears above, four in number, one upon each wing. Its wings, very angulous, are dark underneath; above they are of a reddish dun color. The upper ones have on their superior edge two black oblong spots, with a yellow one between the two. At their extremity is found the eye, large, reddish in the middle, surrounded with a yellow circle, accompanied by a small portion of blue towards the exterior side. On that same side, following the direction of the margin, there are arranged five or six white spots. The inferior wings are browner, and have each a large eye of very dark blue in the middle, surrounded by an ash-color circle. The caterpillar of this butterfly is of a deep black, dotted with a little white.

(3.) *P. iris*, purple emperor. Wings indented, and brown, with a blue gloss, having a whitish interrupted band on each side; with each a single eye; the eyes on the upper pair blind above. Found in our own gardens, and in Europe generally. The male is spotted with white on the upper wings, and is without the eye. The larva is green with two horns, and oblique pale lines.

(4.) *P. machaon*, is an insect of the greatest beauty, and is commonly known by the name of the swallow-tailed butterfly. Color a beautiful yellow, with black spots along the edges of the superior wings: all the wings are bordered with a deep edging of black, decorated by a double row of crescent-shaped spots, of which the upper row is blue, and the lower yellow. The under wings are tailed, and are marked at the inner angle or tip with a round red spot, bordered with blue and black. The larvæ are of a green color, encircled with numerous black bands

spotted with red, and furnished with a pair of short horns, which it occasionally protrudes.

(4.) *P. priamus.* Wings indented, silky; upper pair green above, with a black disc and edge; lower ones with from four to six black spots. This Linnæus considered as the most beautiful of the whole papilionaceous tribe. It measures more than six inches from wing's end to wing's end; the upper wings are velvet-black, with a broad band of the most beautiful grass green drawn from the shoulder to the tip, and another on the lower part of the wing, following the shape of that part; the lower wings are of the same green color, edged with velvet-black, and marked by four spots of that color, while at the upper part of each, or at the part where the upper wings lap over, is a squarish orange-colored spot; the thorax is black, with sprinklings of lucid green in the middle; and the abdomen is of a bright yellow or gold color. On the under side of the animal the distribution of colors is somewhat different, the green being disposed in central patches on the upper wings, and the lower being marked by more numerous black as well as orange spots. It is a very rare insect, and is a native of the island of Amboyna.

Genus 2. *Sphinx.*—*Antennæ* thickest in the middle; *tongue* generally stretched out; *palpi* two; *wings* deflected. The species of this genus are the largest of the lepidoptera order; they fly fast, and mostly in the evening. They derive their generic name *sphinx* from the posture of the larvæ of several large species, which are often seen in an attitude much resembling that of the Egyptian statues, viz. with the fore parts elevated and the rest of the body flat to the leaf. The most remarkable species is the *sphinx atropos*, or death's-head hawk-moth, but in England it is rather rare. It is thus described by Dr. Shaw:—The upper wings are of a fine dark gray color, with a few slight variations of dull orange and white; the under wings are of a bright orange color, marked by a pair of transverse black bands; the body is also orange-colored, with the sides marked by black bars, while along the top of the back, from the thorax to the tail, runs a broad blue-gray stripe; on the top of the thorax is a very large patch, of a most singular appearance, exactly resembling the usual figure of a skull, or death's-head, and is of a pale gray, varied with dull ochre and black. When in the least disturbed, or irritated, this insect emits a stridulous sound, something like the squeaking of a mouse; and from this circumstance, as well as from the mark above mentioned on the thorax, it is held in much dread by the vulgar in several parts of Europe, its appearance being regarded as an ill omen. The caterpillar, from which this curious sphinx proceeds, is in the highest degree beautiful, and far surpasses in size every other European insect of the kind, measuring sometimes nearly five inches in length, and being of a proportional thickness; its color is a bright yellow; the sides are marked with a row of seven most elegant broad stripes or bands, of a mixed violet and sky-blue color; the tops of these bands meet on the back in so many angles, and are varied on that part with jet-black specks; on the last joint of the body is a horn or process, not in an erect position, but hanging or curving over the joint in the manner of a tail, having a rough surface, and a yellow color. This caterpillar is principally found on the potatoe and the jessamine, which are its favorite food. It changes into a chrysalis in the month of September, retiring for that purpose deep in the earth; the perfect insect emerging in the following June or July. The noise of this insect is remarkable, inasmuch as it seems to have the power of affecting the bees in such a manner as to disarm them of their fury, and thus enables her to procure her favorite honey with perfect impunity. 'This cry does not appear to be produced by the wings, for when they and the thorax are held down the noise only increases. Schræter says that the animal, when it utters its cry, rubs its tongue against its head; and Reaumur found, after the most minute examination, that sound was produced by the friction of the palpi against the tongue. When, by means of a pin, the spiral tongue was unfolded, the cry ceased; and when the palpi were prevented from touching it, it again stopped; and, upon removing one of them only, though it continued, it became much more feeble. Huber, however, denies that it is produced by the friction of the tongue, but as he has stated no reasons for this opinion, his mere assertion cannot be allowed to counterbalance Reaumur's experiments.'

Genus 3. *Phalæna.*—*Antennæ* setaceous, and gradually tapering; tongue spiral; wings deflected. The moths of this genus fly only at night, and obtain their food from the nectar of flowers; the larvæ feed voraciously on the leaves of plants. This genus includes the bombyx of Fabricius. Of this almost innumerable tribe of insects, we can select here but a few specimens.

(1.) The first species would undoubtedly be the silk-worm, *P. mori*; but this insect is of sufficient importance to demand a separate article; we shall therefore refer our readers to PHALÆNA and SILK-WORM.

(2.) *P. atlas*, the largest and most splendid of the phalænæ yet known: its wings are falcate, varied with yellow, white and brown, with a transparent spot on each, and two on the upper one. The extent of the wings of this insect measures between eight and nine inches; the ground colour is a fine deep orange-brown, and in the middle of each wing is a large triangular transparent spot; each of these transparent parts is succeeded by a black border, and across all the wings run lighter and darker bars, exhibiting a very fine assortment of varying shades; the upper wings are slightly curved downwards at their tips, and the lower wings are edged with a border of black spots, on a pale buff-colored ground; the antennæ are widely pectinated, with a quadruple series of fibres, exhibiting a highly elegant appearance. This insect is found in America and the East Indies.

(3.) *P. sarcitella.*—Wings cinereous, thorax with a white dot on each side. This belongs to the division tinea, and is found in skin-cloths and woollen furniture; to which it proves terribly destructive. These moths construct the abode in which they reside of the grains of wool or other materials, which they gnaw off. Their food is of

the same substance; and every step they advance, feeling themselves incommoded by the wool in their way, they gnaw a smooth passage for themselves, thus making terrible devastation. Hence these species are among the most destructive of the tribe. The most costly articles of fur are those which are not worn every day; and for this very reason they are most exposed to their attacks.

### Order IV.—Neuroptera.

The insects of this order have four membranaceous wings generally transparent. At the tail they have often pincers but no sting.

Genus 1. *Libellula.*—*Antennæ* short and slender; *maxillæ* more than two; *lip* trisected; *wings* extended; *tail* of the male having pincers. The eyes of this genus are finely adapted for microscopic examination, and by the assistance of a good instrument it will be seen that the eye is divided into a number of hexagonal cells, each of which forms a complete eye. The external parts of these eyes are so perfectly smooth, that, like so many mirrors, they reflect the images of all surrounding objects. Leuwenhoeck says, there are 12,544 lenses on each eye of the libellula. If one of these groups of eyes be nicely taken from the head of the insect, washed clean, and placed before the microscope, its structure is elegantly seen, and it becomes an object worthy of the highest admiration. Each of the eyes is an hexagon, and has the same effect as a convex lens in forming the image of an object placed before it, lessening and beautifying it. The whole of this beautiful tribe is exceedingly ravenous, and may be generally seen hovering over stagnant waters in pursuit of its prey. The amours of the libellulæ are carried on in a peculiar and violent manner. The male hovers on the wing till a female makes her appearance; he then watches an opportunity of seizing her by the head with those pincers with which his tail is armed. In this manner he travels through the air, till the female, yielding to superior strength, forms her body into a kind of circle; hence the libellulæ are frequently seen coupled in the air, exhibiting the form of a ring. The female afterwards retires to some stagnant water, where, by the assistance of a stick or reed, she lowers herself down backwards, till the tip of the tail is immerged a little in the water; she is then seized with a tremor of the body, during which she deposits the egg in the water. The tail is withdrawn from the water, by contracting the annuli; and, by the pressure of these upon each other, the egg is gradually forced from the ovary to the extremity of the tail; whence it is separated by shaking that part in the water. The eggs are of a white color, resembling those produced by the common blow-fly. Of all the insect tribes none are greater enemies of their fellow tribes than these libellulæ, and none are provided with more powerful and singular instruments of assault. They pursue prey in every state, and in the larva are furnished with two pairs of strong jaws covered by a kind of mask. The whole of this apparatus is so singular and admirable that we cannot refrain from giving the following account of it from Messrs. Kirby and Spence's interesting and elegan work;—'In other larvæ the lower lip is usuall small and inconspicuous, and serves merely fo retaining the food and assisting in its deglutition but in these it is by far the largest organ of th mouth, which when closed it entirely conceals and not only retains, but actually seizes th animal's prey, by means of a very singular pai of jaws with which it is furnished. Conceiv your under lip (to have recourse, as Reaumur or another occasion, to such comparison) to be horny instead of fleshy, and to be elongated perpendicularly downwards, so as to wrap over your chin and extend to its bottom—that this elongation is there expanded into a triangular convex plate, attached to it by a joint, so as to bend upwards again and fold over the face as high as the nose, concealing not only the chin and the first mentioned elongation, but the mouth and part of the cheeks: conceive moreover, that to the end of this last-mentioned plate are fixed two other convex ones, so broad as to cover the whole nose and temples,—that these can open at pleasure, transversely like a pair of jaws, so as to expose the nose and mouth, and that their inner edges where they meet are cut into numerous sharp teeth or spines, or armed with one or more long and sharp claws:—you will then have as accurate an idea as can be given of the strange conformation of the under lip in the larvæ of the tribes of *libellulina*; which conceals the mouth and face precisely in this manner. You will probably admit that your own visage would present an appearance not very engaging while concealed by such a mask; but it would strike still more awe into the spectators, were they to see you first open the two upper jaw-like plates, which would project from each temple like the blinders of a horse; and next, having by means of the joint at your chin let down the whole apparatus and uncovered your face, employ them in seizing any food that presented itself, and conveying it to your mouth. Yet this procedure is that adopted by the larvæ provided with this strange organ. While it is at rest, it applies close to and covers the face. When the insects would make use of it, they unfold it like an arm, catch the prey at which they aim by means of the mandibuliform plates, and then partly refold it so as to hold the prey to the mouth in a convenient position for the operation of the two pairs of jaws with which they are provided. Reaumur once found one of them thus holding and devouring a large tadpole; a sufficient proof that Swammerdam was greatly deceived in imagining earth to be the food of animals so tremendously armed and fitted for carnivorous purposes. Such an underlip as I have described is found in the tribe of dragon-flies (libellulina), varied, however, considerably in its figure in the different genera. You will admire the wisdom of this admirable contrivance when you reflect that these larvæ are not fitted to pursue their prey with rapidity, like most predaceous animals; but that they steal upon them, as De Geer observes, as a cat does upon a bird, very slowly, and as if they counted their steps; and then, by a sudden evolution of this machine, take them as it were by surprise, when they think themselves safe.'

The larva remains in the same state about a year before it attains its full size; and, when the period of its transformation has arrived, repairs to the margin of the pond in quest of a convenient situation. It here attaches itself to a plant or piece of dry wood; and the skin, which has gradually become parched and brittle, at length splits opposite the upper part of the thorax, and the perfect insect makes its appearance. *L. grandis* is the largest of this genus found in Britain. The fore part of the head is yellow; the eyes brown, and so large that they meet at the top of the head. The thorax is of a dun color, with four oblique bands on each side of a lemon color. The abdomen is reddish, often spotted with white and black upon the top and bottom of each segment; the small appendices which terminate the abdomen are very long; the wings have more or less of a yellow complexion, and are distinguished by a brown spot on the exterior edges. The colors of the insect vanish when dead. The larvæ of these insects are peculiar for the manner in which they swim, and force themselves along in the water. In most creatures this is done by means of either fins, or arms, or legs; some, indeed, swim along by striking with the tail, but this curious animal moves forward by means of a kind of force-pump in its tail. By means of this curious mechanism it spirts out, with considerable force, the water it has previously sucked up, and the stream thus serves to propel it along.

Genus 2. *Ephemera.*—*Antennæ* short and subulated; *palpi* four, short and filiform; *mouth* having no mandable; *jaws* membranaceous and short, and connected with the lip; two large *stemmata* above the eyes; *wings* erect, lower part very small; *tail* setaceous. Proverbially short as is this creature's life, in the state of a perfect insect; in the larva and pupa states the ephemeræ live one or two years, and some species, it is believed, live even three years from the time of hatching from the egg state, before they arrive at the perfect form. The larvæ are found in the water, wherein they constantly reside, and are the favorite food of fishes. They are active, furnished with six legs, a tail, six lateral fins, or gills, and prey on smaller insects. The pupæ, like the larvæ, are carnivorous, and resemble the former state, except in having the rudiments of the wings apparent. The ephemeræ are so abundant in some countries, that they are used for the purpose of manure, the species vulgata especially. This is the common practice with the husbandmen in Carniola. They are also very numerons on some parts of the Rhine, the Maes, and Isel. The season of their appearance in such multitudes continues, however, only for about three days annually. See the article EPHEMERA

Genus 3. *Hemerobius.*—*Antennæ* setaceous; *mandible* straight and horny; *maxillæ* cylindrical and cleft; *lip* forward and entire; *palpi* four, filiform; *wings* deflected; *thorax* convex. The species of this genus in all their stages feed upon small insects, especially the *aphides;* their larvæ have six feet; in most species they are oval and hairy; the pupæ are inactive, and enclosed in a case. The eggs are deposited on leaves in the midst of *aphides*, and the larvæ attain their growth in fifteen or sixteen days. The most remarkable species is the *H. crysops*; the *wings* of which are hyaline with green veins and brown spots; *body* variegated black and green. The larva of this insect feeds on the aphides, among which it makes terrible havoc, and invariably covers itself with the skins of those it has slain. From the head to the tail, this pigmy destroyer is covered with a thick coat, or rather mountain, composed of the skins, limbs, and down, of these creatures. Reaumur, in order to ascertain how far this covering was necessary, removed it, and put the animal into a glass with raspings of paper; and, in the space of an hour, it had clothed itself with a coat of twice the usual thickness.

Genus 4. *Phryganea.*—*Antennæ* long and bristly; *mandible* short, corneous, arched, and sharp; *maxillæ* membranaceous; *palpi* four; *stemmata* three; *wings* incumbent; hinder ones folded. A principal species is *P. grandis.* Wings brown-testaceous, with cinereous spots. One of the largest of the European phryganeæ: it usually measures an inch, or more, in length, and has very much the general aspect of a phalæna; the upper wings are gray, marked by various darker and lighter streaks and specks, and the under wings are yellowish-brown and semi-transparent. The larva, which measures nearly an inch and three-quarters in length, is of a flesh-colored gray, with brown head and legs, and inhabits a tube composed of pieces of bark, small fragments of grass-stalks, or other substances. Like other larvæ of this genus, it is known by the name of cadew, or caddis, worm, and is frequently used by anglers. When arrived at its full growth it fastens the case or tube to the stem of some water-plant, or other convenient substance, in such a manner as to project a little above the surface of the water, and casting its skin changes to a pupa of a lengthened shape, displaying the immature limbs of the future phryganea, which emerge in the space of a fortnight.

The larvæ in question, says Mr. Kirby, are well known to fishermen by the title of *caddis-worms*, and, if you take them out of the water, you will observe that they inhabit cases of a very singular conformation. Of the larva itself, which somewhat resembles the caterpillars of many *lepidoptera*, nothing is to be seen but the head and six legs, by means of which it moves itself in the water, and drags after it the case in which the rest of the body is enclosed, and into which on any alarm it wholly retires. The construction of these habitations is very various. Some select four or five pieces of the leaves of grass, which they glue together into a shapely polygonal case; others employ portions of the stems of rushes, placed side by side so as to form an elegant fluted cylinder; some arrange round them pieces of leaves like a spirally-rolled riband; others enclose themselves in a mass of the leaves of any aquatic plants united without regularity; and others again form their abode of minute pieces of wood either fresh or decayed. These are usually open at each end. Since they must reside in these cases, when they are become pupæ, till the time of their final change approaches, if they are left open, how are the animals, now become torpid, to keep out their enemies? Or, if

they are wholly closed, how is the water, which is necessary to their respiration and life, to be introduced? These sagacious creatures know how to compass both these ends at once. They fix a grate or portcullis to each extremity of their fortress, which at the same time keeps out intruders and admits the water. These grates they weave with silk spun from their anus into strong threads, which cross each other, and are not soluble in water. One of them, described by De Geer, is very remarkable. It consists of a small thickish, circular lamina of brown silk, becoming as hard as gum, which exactly fits the aperture of the case, and is fixed a little within the margin. It is pierced all over with holes disposed in concentric circles, and separated by ridges which go from the centre to the circumference, but often not quite so regularly as the radii of a circle, or the spokes of a wheel. These radii are transversed again by other ridges, which follow the direction of the circles of holes; so that the two kinds of ridges crossing each other form compartments, in the centre of each of which is a hole

One forms a horn-shaped case composed of grains of sand, so equal in size, and so nicely and regularly gummed together, the sides throughout being of the thickness of one grain only, that the first time I viewed it I could scarcely persuade myself it could be the work of an insect. The case of *P. bimaculata*, which is less artificially constructed of a mixture of mud and sand, is pyriform, and has its end curiously stopped by a plate formed of grains of sand, with a central aperture. Other species construct houses which may be called alive, forming them of the shells of various aquatic snails of different kinds and sizes even while inhabited, all of which are immoveably fixed to it, and dragged about at its pleasure: a covering as singular as if a savage, instead of clothing himself with the squirrel's skin, should sew together into a coat the animals themselves. However various may be the form of the case externally, within it is usually cylindrical and lined with silk, and even those that are most careless about the nature of the materials of their houses, are solicitously attentive to one circumstance respecting them, namely, their specific gravity. Not having the power of swimming, but only of walking at the bottom of the water by aid of the six legs attached to the fore part of the body which is usually protruded out of the case, and the insect itself being heavier than water, it is of great importance that its house should be of a specific gravity so nearly that of the element in which it resides, as while walking neither to incommode it by its weight, nor by too great buoyancy; and it is as essential that it should be so equally *ballasted* in every part as to be readily moveable in any position. Under these circumstances our caddis-worms evince their proficiency in hydrostatics, selecting the most suitable substances, and, if the cell be too heavy, gluing to it a bit of leaf or straw; or, if too light, a shell or piece of gravel. It is from this necessity of regulating the specific gravity, that to the cases formed with the greatest regularity we often see attached a seemingly superfluous piece of wood, leaf, or the like.

Genus 5. *Panorpa.*—*Antennæ* filiform; *palpi* four; *rostrum* cylindrical and corneous; *mandible* no teeth; jaws bifid at the point; *lip* long, and covering the whole mouth; the male having a *tail* chelated. P. communis is, as its name imports, the most familiar of all the species. It is frequently seen in our meadows during the early part of the summer. It is a long-bodied fly, of a moderate size, with four transparent wings, elegantly variegated with deep brown spots; the tail of the male insect, which is generally carried in an upright position, is furnished with a forceps.

Genus 6. *Raphidia.*—*Antennæ* filiform, and of the same length with the thorax, and cylindrical; *palpi* four, short, and filiform; *mandible* arched and corneous, dentated; *jaw* corneous and obtuse; *lip* corneous, round, and entire; *wings* deflected; female's *tail* setaceous. This genus is said to walk on the knees. Species R. notata, having *wings*, with a brown marginal spot; a *body* black, *head* with a testaceous spot; *legs* testaceous: appendage of female as long as the body.

### Order V.—Hymenoptera.

The insects of this order are all furnished with four membranaceous wings, and a *mouth*, having maxillæ. Some of the females are provided with a sting concealed within the abdomen, and furnished with a poison-bag; others have an oviduct, with which they pierce wood, &c., to deposit their eggs. The larvæ have, some no feet, others sixteen; they change to pupæ incompletæ, which are enclosed in cases. Some of the insects live in societies, some entirely alone.

Genus 1. *Cynips.*—The *mouth* is armed with *jaws*, but has no *proboscis;* the *sting* is spiral, and concealed within the body. The *cynips* pierce the leaves of plants with their sting, and deposit their eggs in the wound; the extravasated juices rising around, form a gall, which gradually becomes hard, and in this the larva lives, and feeds, and changes into a pupa. Thus are produced the galls so valuable in commerce as a principal ingredient in ink, and in dyeing. See the articles Cynips, and Galls, in the body of our work.

Genus 2. *Tenthredo.*—*Palpi* four, filiform, and unequal; *mandible* toothed, corneous, and arched; *jaws* obtuse at the point; *lip* cylindrical and trisected. The larvæ have from fourteen to twenty-eight feet, and a round head; and, if touched, roll themselves together. In this state, their food is the leaves of plants. When about to enter the pupa state, they make a net-work case, within which they remain as pupæ for the greater part of the winter. The species are very numerous, and appear to be migratory. In August, 1782, they were observed in Norfolk to come over the sea by the fishermen and farmers, and on the beach and cliffs they might be taken up by shovels-full. It has, however, been thought that they only come from Lincolnshire. An important species is the T. lutea, which is of a yellow color mostly, and has five yellow antennæ. It proceeds from a large green larva, with a double row of black specks on each side, and a dusky line down the back, bounded on each side by yellow. It feeds on various species of willow

alder, and beech. The parchment-like case in which it envelopes itself in autumn is of a pale yellowish-brown color; and the chrysalis, which is of a pale dusky, or brownish cast, exhibits the limbs of the future fly, in size equal to a common wasp, and of a yellow color, bound with black; the antennæ rather short, and strongly clavated.

Genus 3. *Sirex.*—*Antennæ* filiform; joints twenty-four; *palpi* four, hind ones long and clavated; *mandible* thick, short, corneous, and dentated; *jaw* ciliated; *wings* lanceolate, and not folded; *abdomen* sessile, terminating in a poison-*sting*, or *oviduct*, exserted, serrate, and stiff. The largest and finest species is the S. gigas, the abdomen of which is yellow at the base and tip; the body blue-black, and about the size of that of a hornet. This insect frequents the pines, and has a strong conspicuous sting. The larva, which measures about an inch and a quarter in length, is of a yellowish-white color, and inhabits decayed firs; it bears some resemblance to the beetle larvæ, but is thinner, and has a short black spine at the tip of the abdomen. It changes to a chrysalis in the month of July, first enveloping itself in a slight silken web, of a whitish color. The chrysalis is of a lengthened shape, with the future insect very distinctly characterised. If the change to chrysalis takes place in summer, the fly is produced in about three weeks; but if at the close of autumn, the animal continues a chrysalis the whole winter emerging in the following spring. The male insect is considerably smaller than the female, and may be farther distinguished by the want of the caudal tube; and the tip of the abdomen is of a black color.

Genus 4. *Ichneumon.*—*Antennæ* setaceous; mouth having straight membranaceous *maxillæ*, bifid, rounded at the apex, corneous, dilated, and ciliated; *mandible* corneous, arched, and acute, but without teeth; *lip* cylindrical, corneous, emarginated, and toward the apex membranaceous; *palpi* four, filiform and unequal.

The species included in this genus amount, in Britain alone, to 800; Linné seems to have so named it from the parasitical habits of the insects; and the similarity of the services they perform, to those of the Egyptian deity of this name.

They deposit their eggs in the larvæ or pupæ of other insects, and both animals proceed toward their subsequent states, in many instances together; but the invaded insect never attains its perfect growth, for these parasites feed on its substance. When their larvæ are full grown they burst the skin in various places, and, spinning themselves up in a small oval silken case, change into pupæ; the whole number forming a groupe on the shrivelled body of the caterpillar which had afforded them nourishment; and, after a certain period, emerge in the state of complete ichneumons. One of the most familiar examples of this process, is afforded by the well-known caterpillar of the common white or cabbage butterfly; which, in the autumnal season, may be frequently observed to creep up some wall, or other convenient surface, in order to undergo its own change into chrysalis; but, in the space of a day or two, a numerous tribe of small maggots will be seen to emerge from it, and immediately proceed to envelope themselves in distinct yellow silken cases; the whole forming a groupe around the caterpillar. The ichneumons proceeding from these are the species called by Linnæus ichneumon glomeratus: their color is black, with yellow legs: they usually make their appearance in about three weeks from the time of their spinning themselves up. Other small species of ichneumon pierce the skins of newly-changed chrysalides of butterflies and moths, in which their larvæ remain during their own incomplete state; as the ichneumon puparum of Linnæus, a very small species, of a gilded green color. Others, again, are so very small that the female pierces even the eggs of moths and butterflies, and deposits her own in each; as the ichneumon ovulorum of Linnæus, one of the smallest of the whole tribe: it is of a black color, with rufous legs, and long filiform antennæ. Some ichneumons are of a very considerable size, and the females of these select some larger caterpillar for their victim; as those of the larger sphinges, such as the S. ligustri, convolvuli, &c.; or one of the large and middle-sized moths, as the phalæna vinula, quercus, &c. These large ichneumons are generally bred in small numbers, and sometimes the female deposits but a single egg in the selected caterpillar. This may be instanced in the I. *ramidulus*, the larva of which is thus bred in the caterpillar of the sphinx ligustri: it is a very large ichneumon, of a dull yellowish color, with a cast of brown on the thorax, and with the antennæ and abdomen tipped with black: the abdomen is also of a falciform shape, curving downwards, and compressed on the sides. I. *luteus* is a large species, nearly allied to the former, and of similar manners.

The seeming severity of the process ordained by nature, for giving birth to the genus ichneumon, may be much diminished by supposing, (what all the ensuing phenomena seem to imply) that, after the first operation of piercing the skin, and depositing the eggs, is performed by the female ichneumon, the caterpillar feels no acute pain; the enclosed enemies feeding only on its juices, and evidently sparing the more important organs; so that it loses its life by a gradual decay.

From the observations hitherto made by entomologists,' again to adopt the valuable observations of Mr. Kirby, 'it would appear that the great body of the ichneumon tribe is principally employed in keeping within their proper limits the infinite host of lepidopterous larvæ, destroying, however, many insects of other orders; and, perhaps, if the larvæ of these last fell equally under our observation with those of the former, we might discover that few exist uninfested by their appropriate parasite. Such is the activity and address of the *ichneumonidæ*, that scarcely any concealment, except, perhaps, the waters, can secure their prey from them; and neither bulk, courage, nor ferocity, avail to terrify them from effecting their purpose. They attack the ruthless spider in his toils: they discover the retreat of the little bee, that for safety bores deep into timber; and though its enemy ichneumon cannot enter its cell, by means of her

long ovipositor she reaches the helpless grub, which its parent vainly thought secured from every foe, and deposits in it an egg, which produces a larva that destroys it. In vain does the destructive *cecidomyia* of the wheat conceal its larvæ within the glumes that so closely cover the grain. three species of these minute benefactors of our race, sent in mercy by Heaven, know how to introduce their eggs into them, thus preventing the mischief they would otherwise occasion, and saving mankind from the horrors of famine. In vain, also, the cynips by its magic touch produces the curious excrescences on various trees and plants, called galls, for the nutriment and defence of its progeny: the parasite species attached to it discovers its secret chamber, pierces its wall, however thick, and commits its destroying egg to its offspring. Even the clove-weevil is not secure from the legumen of that plant; nor the wire-worm in the earth, from their ichneumonidan foes. Others are not more secure by the repulsive nature of the substance they inhabit, for two species, at least, of ichneumon know how to oviposit in stercoraceous larvæ without soiling their wings or bodies. An idea of the services rendered to us,' adds this gentleman, 'by those ichneumons which prey upon noxious larvæ, may be formed from the fact, that out of thirty individuals of the common cabbage caterpillar (the larvæ of *papilio brassicæ*) which Reaumur put into a glass to feed, twenty-five were fatally pierced by an ichneumon (I. globatus). And if we compare the myriads of caterpillars that often attack our cabbages and brocoli with the small number of butterflies of this species which usually appear, we may conjecture that they are commonly destroyed in some such proportion.

Genus 5. *Sphex*.—*Antennæ* filiform; *palpi* four; *mandible* incurved, corneous, and dentated; *jaw* entire; *lip* corneous with a membranaceous point; *sting* concealed. The insects of this genus live in sand-banks; they feed on umbelliferous plants; the larvæ inhabit and feed on the dead bodies of insects in which the mother deposited her eggs. The insects are the most rapacious of this order, and, attacking indiscriminately whatever insect comes in their way, soon overcome it with their poisonous sting.

One of the most handsome species is the fasciata, the color of which is black with two white bands on the abdomen, the first broken; the tail white, thorax black covered down; the fore margin is marked with a white line; the wings are white but tipped with brown.

Genus 6. *Chrysis*.—*Antennæ* filiform, bent, with twelve joints; *mouth* armed with *jaws*, but no *proboscis; abdomen* arched, with a scale on each side; *wings* plain; *body* appearing as if gilt (whence the name); *anus* dentated, and armed with a *sting*, which is somewhat exserted. These insects, when alarmed, roll themselves up into a ball; and, exposing nothing but a hard scaly skin, thus enter with impunity the nests of the stinging hymenopteræ, and deposit their eggs without injury to themselves. See our article CHRYSIS.

Genus 7. *Vespa* (the wasp).—*Antennæ* filiform, first joint elongated and cylindrical; mouth corneous, having the *maxillæ* compressed, without proboscis; *palpi* four, unequal and filiform; *eyes* lunated; *body* smooth; with the sting concealed; and the upper wings plicated.

This genus comprehends, in Gmelin's Systema Naturæ, 159 species. In general they are remarkable, like the apis, for the dexterity with which they construct their nests, which in those of many species is of great size; for always living in society; and for their depredations on the bee and other tribes of insects, particularly flies.

*V. vulgaris*, the common wasp, has four wings and six feet; its body is yellow with black triangular spots; the common wasp breeds in the ground. There is another and fiercer but happily very rare kind, which breeds in woods and mountains; they are larger, have broader bodies, and much more black about them; their sting is remarkably larger in proportion to their back. Reaumur (Hist. Acad. Sc. Paris, 1719), and Derham (Phil. Trans. No. 382. p. 53. or Abr. vol. viii. p. 404), distinguish three sorts of wasps; viz. the queens or females, the males, and the common laboring wasps, called mules, which according to Reaumur, are neither males nor females, and consequently barren. The queens, of which there is a considerable number, though fewer than the males, and of course much fewer than the neutral or laboring wasps, are much longer in the body, and larger than any other wasp; they have a large heavy belly, corresponding in size to the prodigious quantity of eggs with which they are charged. The males are less than the queens, but longer and larger than the common wasps, which are the smallest of the species: they have no stings, with which both the queens and common wasps are furnished. There are in one nest two or three hundred males, and as many females; but their number depends on the size of the nest; and Dr. Derham observed that the males were bred, or at least mostly resided, in the two cells or partings, between the combs, next to the uppermost cell. The antennæ or horns of the male wasps are longer and larger than those of either of the other sorts; but the chief difference, says Dr. Derham, consists in their parts of generation, which are altogether different from those of other wasps. The mules are the laborers of the nest, employed in procuring materials, and in constructing them, as also in procuring provisions for the other wasps and their young.

Almost every person must have seen the establishment made under ground by the common wasp. It is a kind of subterraneous city, which at certain seasons of the year contains many thousands of inhabitants, and is constructed nearly with the same ingenuity and elegance as that of the honey-bee. Like it, it is internally formed with combs consisting of a number of hexagonal cells, all enveloped under one common covering, and constructed with great art. In this particular they even excel the bee, which contents itself with the cover afforded by the hive, or with the trunk of a rotten tree, in their wild state.

Though wasps generally make choice of some large hole under ground for the construction of

their nest, they have nevertheless much labor to undergo in removing protuberances, and carrying away earth, till it is brought to that spherical figure which suits their purposes. This work completed, they next construct that paper-like covering with which the whole hive is lined. The combs in which the cells are lodged next claim their attention. These are ranged horizontally in different stories, sometimes twelve or fifteen above each other, all supported by colonnades, between which all the citizens of this subterraneous commonwealth are seen at times to walk like men in the streets of a town. The cells of the wasps are not constructed with that geometrical skill which has been so often admired in those of the bee; but they are not on that account the less adapted to the purposes they are destined to serve. Each comb has only a single range of cells, with their mouths opening below. They are intended, not for the reception of honey, but for the habitation of the young, which are fed twice or thrice a-day, by morsels carried in by the parents. For the more commodious reception of its food, each of the larvæ has its head turned downwards opposite to the mouth of its cell, ready to receive its meal when offered. There are, however, many varieties in the construction of wasp-hives, all suited to the views of the different species that inhabit them. Some have only a single row of cells, placed vertically, like those of the bee, the mouths facing the sun: the reason of this variety seems to be, that some kinds require the heat of the sun to hatch their eggs; an advantage which could not be obtained were there more rows of cells, or were they placed in a different manner.

Reaumur observes that when the females that have survived the winter begin, at the return of spring, to lay their eggs, they first lay those which hatch mules, and at this time they build cells of a smaller size to lodge the eggs from which they are produced: they afterwards build larger cells, and fill them with the largest eggs, which are those of the males and females. This writer says, that the copulation of the males and females is visible, and he has given a particular account of it; observing that it is performed in October, like that of all other flies. When winter begins, the wasps destroy all the eggs, and all the young ones without exception; all the mules and males which have been employed in this work, being unfurnished with provisions, perish; and none survive, except some few females, which, according to Reaumur, were fecundated in October, and raise a new colony in spring.

The V. *crabro*, or hornet, has its thorax black on the fore part, and unspotted, the incisures of the abdomen being marked with a double contiguous black spot. This species is much more formidable than the common wasp, and of considerably larger size; its sting is often productive of serious consequences. Its color is tawny yellow, with ferruginous and black bars and variegations. The nest is generally built in the cavity of some decayed tree, or immediately beneath its roots; and not unfrequently in timber-yards. It is of smaller size than that of the wasp, and of a somewhat globular form, with an opening beneath; the exterior shell consisting of more or fewer layers of the same strong paper-like substance with that prepared by the wasp: the cells are also of a similar nature, but much fewer in number, and less elegantly composed. The hornet, like the wasp, is extremely voracious, and preys on honey, fruit, and almost any kind of fresh animal substances which it can obtain.

Ray describes a peculiar species of wasp, which builds a small nest, usually fixed to a beam of some old building, and has only one aperture, which is about half an inch wide, and serves for the wasps to go in and out at. This opening is always exactly opposite to that part of the hive where it adheres to the beam. The hive or nest is covered with a thin membranaceous substance, resembling paper, of a brown color, with streaks of white, disposed in regular circles. The whole nest is about three inches in diameter, and is usually composed of about nine crusts; when these are cut away, there appears a round comb in the centre, and a smaller above it, fixed up by a pedicle arising from the centre of each. In every one of these cells, which are hexagonal, as those of the common wasp, is reared one worm, which, in fine, becomes a wasp. This species of wasp is also larger than the common one. An elegant nest is attributed by Latreille in the Annales du Museum National d'Histoire Naturelle, No. 4, to the Vespa Holsatica of Fabricius, which is found both in England and France as well as in many other parts of Europe. It does not much exceed the size of an egg, but is of a more globular form, and consists of several concentric bells, with considerable intervals between each, the interior alone being entire, and furnished with a small round orifice; the rest reaching only about two-thirds from the base of the nest. In the centre of the complete or entire bell is situated the congeries of cells, built round a small central pillar attached to the base: the cells are not very numerous, and their orifices look downwards. It is generally attached by its base to old thatch or roofing.

Of the ichneumon wasp, which are smaller than all the others, but have the same colors generally, Ray mentions thirty-two species. They usually live in the holes of mud-walls, and make a sort of porch of mud before the door of their cells. This is the wasp usually found issuing from the body of the common cabbage caterpillar. See the *Ichneumon* genus.

Genus 8. *Apis* (the bee).—Having devoted a considerable portion of space to the separate consideration of this important insect, we shall only complete our system by defining its generic characters; which are—*antennæ* filiform; *mouth* horny, corneous, having the *maxillæ*, and *labium* membranaceous at the apex; *tongue* inflected; *palpi* four, unequal and filiform; *wings* not folded: *aculeus* in the females and neuters concealed in the abdomen. Mr. Kirby in his excellent Monographia Apum Angliæ, 2 vols. 8vo., has described upwards of 200 indigenous species of this genus. See APIS.

Genus 9. *Formica* (the ant).—This genus we have also treated distinctly. See ANT and

FORMICA. We therefore only state its generic characters. *Antennæ* filiform; *palpi* four, and unequal, having cylindrical articulations, on a submembranaceous cylindrical lip; between the thorax and the abdomen is a small erect scale; the *sting* is concealed in the abdomen, and possessed only by the females and neuters; which latter are apterous, and have no wings.

Genus 10. *Mutilla.* — *Antennæ* filiform; *palpi* four, of which the articulations are obconic, seated on the top of the lip; *maxilla* membranaceous at the tip; the *lip* projecting obconic; most species are apterous; the *body* is pubescent; *thorax* retuse behind; the *sting* pungent and concealed. Between forty and fifty species have been described.

Remarkable species are, M. *helvola*, of a pale claret-red color, the abdomen is cylindrical, pubescent at the tip; and the thighs are compressed: it inhabits Southern Africa. M. *coccinea*. Scarlet; abdomen marked with a black belt. It inhabits North America. The wings are black, but in general it is an apterous insect. M. *antiguensis*. Scarlet; tip of the abdomen black, with white streaks, inhabiting Antigua. The M. *coccinea* is said to be not the least formidable of armed insects. It is happily not very common, but the females appear in Maryland, in July and August. A person stung by one of them, is said by Mr. Forster, to have lost his senses in five minutes afterwards, and to have become so ill in consequence, that his life was despaired of.

## ORDER VI.—DIPTERA.

This order, indebted for its name (δις, twice, or double, and πτερον, a wing) to Aristotle, embraces all insects which have but two wings, with *halteres*, poisers, or balancers, at their base. The mouth is furnished with a proboscis, connected in some genera with a vagina, in others with two palpi, but having no maxilla. The eyes are large and reticulated. Some are viviparous; others oviparous. The larvæ vary much in different genera. Generally they do not cast their skins, and they commonly appear like a small worm; the likeness to which is heightened by the animal having no feet, and in some species by the head being soft, like the body. Others differ in having the head scaly. They are sometimes blunt at the anterior part; and acute behind: in other instances pointed at both ends. Many live in watery places; others feed on the juice of vegetables; others again on decayed animal matter. The hippobosca, a genus of this order, does not appear to have any larva. The nerves of the larvæ, in some of the muscæ, as M. chamæleon, &c. (stratiomys, Fabr.) have some resemblance to those of the larva of scarabæus nasicornis.

Genus 1. *Œstrus.*—*Antennæ* short, setaceous; the *haustellum* drawn within the lips, which are thick, and without palpi, having a small passage; the *vagina* membranaceous, cylindrical, and obtuse, having generally three short, flexible setæ. The larva of the œstri deposits its eggs in various parts of the bodies of cattle, which, when hatched, produce the most painful tumors. Some lay their eggs under the skin of cows or oxen, which they perforate for that purpose: others enter the intestines of horses by the vent; and others, again, deposit them in the nostrils and skin of sheep, rein-deer, &c. The larva of œstrus bovis is brown, and consists of eleven segments, with transverse rough interrupted lines. That of equi, known by the name of bots, deposits its eggs on the hairs of horses, and always on those parts which are most likely to be licked with the tongue, and are thus conveyed into the stomach. The eggs of Œ. hæmorrhoidalis are laid on the lips of horses, occasioning a titillation, which causes the animal, when attacked by it, to move its head violently, and gallop about with every symptom of distress: this larva is carried into the intestines like the former, and is voided with the dung when its period of change to the pupa state approaches. The larvæ are without feet, short, thick, soft, and annulate, and often furnished with small hooks. Twelve species have been described.

The earliest writers on the science of entomology paid attention to the habits of this formidable genus. The celebrated Reaumur, in particular, was a close observer of its habits. He repeated the experiments of Vallisnieri respecting the Œ. ovis, equi, and hæmorrhoidalis species, and fully confirmed all he had said respecting them; accompanying the account, in his Memoirs, with ample details of their appearance and habits, and his descriptions with much better representations of them than his predecessor. Madame de Breauté, an abbess, in whose praise he enlarges, at length furnished him with an opportunity of getting the *larvæ* of the Œ. *bovis* from some of the cows belonging to her convent; and on them he made his observations. Among other remarks, in this interesting memoir, he mentions, that by a singular chance he observed a line of small air-bubbles arranged along the side of the insect, and placed opposite to the spiracula, being entangled in the pus, which every where covered its surface, and corresponding in number and position to these openings: which would seem to prove that these spiracula are designed, not for the admission of air, as is generally conceived, but in reality for its exit; the air being received by a cartilaginous tube opening at one end of the insect, viz. that extremity which is placed next the external opening of the skin, and which becomes the tail part of the future insect, the larva being, in reality, inverted in the abscess. He very candidly observes, however, that he could not force any air through these apertures, by holding the larva under water, and compressing it with the fingers. He also noticed, that the opening in the skin, through which the larva breathes and evacuates, is considerably enlarged about the period of its exit, by the animal's raising itself in the abscess, and pressing against it; and after some days of this discipline, the aperture being enlarged, he works himself through by successive efforts, and falls to the ground. This excellent observer particularly mentions also their launching themselves from the back of the animal at an early hour of the morning in preference to any other part of the day. The perfect insect, he observes, could not be induced to take any kind of food or nourishment, though he presented it with a great variety.

Linné first arranged the members of this extraordinary family under the title of œstrus, being acquainted only with the five European species, Œ. bovis, tarandi, hæmorrhoidalis, nasalis, and ovis: but his characters of these are so appropriate, as to be retained by the most accurate writers to the present day. Through the whole of his life he had never met with the true fly produced by the ox-bot, but had constantly taken a very dissimilar one which infests the horse for it. This insect, indeed, is, according to Mr. Clarke, truly rare. Vallisnieri had never seen but one, and that was mutilated. Reaumur, with uncommon pains, had raised two or three to the perfect state of a fly, and informs us, that to effect his purpose more completely, he employed a cow-herd to collect for him, promising him the price of half a day's labor for each he should bring; but out of thirty procured by this means not one lived.

The real larva of the Œ. bovis possesses neither the aculei, lips, or marginal setæ, of the other tribes. It has a species of hooks attached to its body, in the place of legs, and these enable it both to move about in the abscess it forms at pleasure, and to crawl out when ripe. It also renders the use of the tentacula, observable at the small end in the other species, not necessary in this. The pain it seems to inflict in depositing its eggs, is very severe. When one of a herd of cattle is attacked by this fly, it is easily known by the extreme terror and agitation of the whole number. The unfortunate object of the attack runs bellowing from among them to some distant part of the heath, or the nearest water. The tail, from the severity of the pain, is held with a tremulous motion straight from the body; and the head and neck stretched out to the utmost. The rest, from fear, generally follow to the water, or disperse to different parts of the field. If oxen are yoked to the plough, when attacked by this fly, it is attended with real danger to the drivers: since they become perfectly uncontrolable, and will often run with the plough directly forwards through the hedges, or whatever obstructs their way.

The singular scene attending such an attack, was long ago described by Virgil:

> —— Est lucos Silari circa, ilicibusque virentem
> Plurimus Alburnum volitans, cui nomen asilo
> Romanum est, oestron Graii vertere vocantes:
> Asper, acerba sonans: quo tota exterrita sylvis
> Diffugiunt armenta; furit mugitibus æther
> Concussus, sylvæque, et sicci ripa Tanagri.
>
> *Georg.* lib. iii. ver. 146—151.

The strongest and healthiest beasts, says an able paper in the third vol. of the Transactions of the Linnæan Society, seem constantly to be preferred by this fly; and their possessing them on their backs is considered as a criterion of goodness with the dealers in cattle: the tanners observe, that their best and strongest hides have the greatest number of bot-holes in them. The whole of this family of insects appear to have a strong dislike to moisture; since the animals find a secure refuge, when they get into a pond or brook, where the other flies which annoy them follow without hesitation, but the œstri rarely or never: and during very cold, rainy, or windy weather, they are not to be seen. Among the country-people, the larvæ of this insect are commonly known by the name of warbles, wornuls, or wormuls, or more properly bots.

Of the *œstrus equi*, or large horse-bot, this writer says, 'These larvæ attach themselves to every part of the stomach, but are in general most numerous about the pylorus, and are sometimes, though much less frequently, found in the intestines. They hang most commonly in clusters; being fixed by the small end to the inner membrane of the stomach, where they adhere by means of two small hooks or *tentacula*. When removed from the stomach, they will attach themselves to any loose membrane, and even to the skin of the hand; for this purpose, they draw back their hooks almost entirely within the skin, till the two points of these hooks come close to each other; they then present them to the membrane, and keeping them parallel till it is pierced through, they expand them in a lateral direction; and afterwards, by bringing the points downwards, or towards themselves, they include a sufficient piece of the membrane with each hook, and thus remain firmly fixed, for any length of time, without any farther exertion from the animal.

'All those bots which feed on the mucous membranes lining the canals of the body, are provided with these tentacula; whilst those which inhabit beneath the skin, will be found universally without them. The œstrus of the sheep has them also, but uses them only in passing over the membranes on which it lives, making them a fixed point to which it draws up its body, and thus secures its passage along those smooth and lubricated surfaces of the nostrils. The larva of this bot, when very young, is of a cylindrical figure, of a pellucid ruby red, and appears without spines to the segments. As it acquires an increase of size, it assumes a more flattened appearance, becomes whiter; and the spines, which are tipt with black, become very visible, being placed in double lines, and are directed towards the tail, or truncated end of the larva. Their food is probably the chyle, which, being nearly pure aliment, may go almost wholly to the composition of their bodies without any excrementitious residue; though, on dissection, the intestine is found to contain a yellow or greenish matter, which is derived from the color of the food, and shows that the chyle, as they receive it, is not perfectly pure. The slowness of their growth, and the purity of their food, must occasion what they receive in a given time to be proportionably small; from whence probably arises the extreme difficulty there is found in destroying them by any medicine or poison thrown into the stomach. Opium, tobacco, or the drastic purgatives, which often bring away in abundance the common worms of the intestines, produce little or no effect on these.'

The larvæ of the large horse bot, we are told in the same able paper, attain their full growth in May, and are coming from the animal from the latter end of that month to the latter end of June. On dropping to the ground, they explore some convenient retreat, change to the pupa, and in about six or seven weeks the fly appears.

The important injuries sustained from this quarter at some seasons by our agriculturists will warrant our extracting some further particulars of the habits of this genus:

'The mode pursued by the parent fly, to obtain for its young a situation in the stomach of the horse, is truly singular, and is effected in the following manner:—When the female has been impregnated, and the eggs are sufficiently matured, she seeks among the horses a subject for her purpose; and advancing on the wing, she holds her body nearly upright in the air, and her tail, which is lengthened for the purpose, curved inwards and upwards. In this way, she approaches the part where she designs to deposit the egg; and, suspending herself for a few seconds before it, suddenly darts upon it, and leaves the egg adhering to the hair; she hardly appears to settle, but merely touches the hair with the egg held out on the projected point of the abdomen. The egg is made to adhere by means of a glutinous liquor secreted with it. She then leaves the horse at a small distance, and prepares a second egg; and poising herself before the part, deposits it in the same way. The liquor dries; the egg becomes firmly glued to the hair; and this process is repeated by various flies, till 400 or 500 eggs are sometimes placed on one horse. The horses, when they become used to this fly, and find it does them no injury, as the *tabani* and *conopes*, by sucking their blood, hardly regard it, and do not appear at all aware of its insidious object.

'The inside of the knee is the part on which these flies are most fond of depositing their eggs, and, next to this, on the side and back part of the shoulder, and less frequently on the extreme ends of the hairs of the mane. But it is a fact worthy of attention, that the fly does not place them promiscuously about the body, but constantly on those parts which are most liable to be licked with the tongue; and the ova, therefore, are scrupulously placed within its reach. Whether this be an act of reason or instinct, it is certainly a very remarkable one; and one should suspect, if it was the latter, it ought to direct the performance of the act in one way only. Whichever of these it may be, it is without doubt one of the strongest examples of pure instinct, or of the most circuitous reasoning, any insect is capable of. When they have remained on the hairs four or five days, they become ripe, after which time the slightest application of warmth and moisture is sufficient to bring forth in an instant the latent *larva*. At this time, if the tongue of the horse touches the egg, its *operculum* is thrown open, and a small active worm is produced, which readily adheres to the moist surface of the tongue, and is from thence conveyed with the food to the stomach.

'It is fortunate for the animals infested by these insects, that their numbers are limited and kept within bounds, by the hazards they are exposed to. I should suspect near a hundred are lost for one that arrives at the perfect state of a fly. The eggs, in the first place, when ripe, often hatch of themselves; and the larva, without a nidus, crawls about till it dies; others are subject to be washed off by the water, or are hatched by the sun and moisture thus applied together; when in the mouth of the animal, they have the dreadful ordeal of the teeth and mastication to pass through; and on their arrival at the stomach, they may pass, mixed with the mass of food, into the intestines; and when full grown, on dropping from the anus to the ground, a high road or water may receive them; if on the common, they are in danger of being crushed to death, or of being picked up by birds, which so constantly for food attend the foot-steps of the cattle. Such are the contingencies by which nature has prevented the too great increase of their numbers, and the total destruction of the animals they feed upon.'

The perfect fly has a great aversion to cold and moisture, and never pursues the horse into the water.

The larva of the *œstrus hæmorrhoidalis*, or small horse-bot, is in many respects like the former, and occupies the same situation in the stomach of the horse. It is distinguished not only by its smaller size, but by being nearly or quite destitute of spines, on leaving the rectum; when full grown, it is of a reddish-green color, and in about two days assumes the pupa state.

'I have not seen any writer,' says the paper we have already quoted in this article, 'who has conjectured the real mode in which this fly deposits its *ova*; which having discovered, by repeated opportunities of witnessing it, I can speak of with certainty. The part chosen by this insect for this purpose is the lips of the horse, which is very distressing to the animal from the excessive titillation it occasions: for he immediately after its touch rubs his mouth against the ground, his fore legs, or against a tree; or, if two are standing together, they often rub themselves against each other.

'At the sight of this fly the horse appears much agitated, and moves his head backwards and forwards in the air, to balk its touch, and prevent its darting on the lips; but the fly, watching for a favorable opportunity, deposits its eggs from the point of the abdomen, and he continues to repeat his attacks on the lip, till the enraged animal endeavours to avoid it, by galloping away to a distant part of the field. If it then continues to follow, or teaze him, his last resource is in the water, where the œstrus is never observed to pursue him. The teazing of other flies may sometimes occasion a motion of the head similar to this; but it should not be mistaken for it, as it is never in any degree so violent as during the attack of the œstrus.

'At other times I have seen this fly get between the legs of the horse whilst he is grazing, and then make his attack on the lower lip. The titillation occasions the horse to stamp violently with his fore-foot against the ground, and he often strikes with his foot as though aiming a blow at the fly. They also sometimes hide themselves in the grass; and, as the horse stoops to graze, they dart on the mouth or lips, and are always observed to poise themselves during a few seconds in the air, while the egg is preparing on the point of the abdomen. When several of these flies are confined in a close place, they have a particularly strong fusty smell, such as

we feel when animals are confined in a close place: and I have observed both sheep and horses, when teazed by them, to look into the grass, and smell it very anxiously; and, if by these means they discover the fly, they immediately turn aside, and hasten to a distant part of the field. The eggs of this species appear of a darker color than the former, and are provided with a *petiolus*, or foot-stalk from the small end, the opposite being obtuse, and provided with an *operculum;* it is also ribbed in a transverse direction, unlike the eggs of the preceding species. Our ancestors imagined that poverty or bad food engendered these animals, or that they were the offspring of putrefaction. In Shakspeare's Henry the Fourth, part 1st, the hostler at Rochester says, 'peas and beans are as dank here as a dog, and that is the next way to give poor jades the bots;' and the miserable nag of Petruchio is said to be so 'begnawed with the bots.' When the animal is kept from food, the bots are also; and, it is natural to suppose, are then the most troublesome; whence arose the idea, that poverty or bad food could engender them.

'Of the *œstrus veterinus*. This insect was known to Linnæus, who gave it the name of *nasalis*, from an idea of its entering the nostrils of the horse, and depositing its eggs in the fauces: 'Habitat in equorum fauce per nares intrans.' Linn. Syst. Nat. 2, p. 969, which as it could not well do without destroying its own wings, is probably as much a fable as the 'miré per anum *intrans*,' of the preceding species. We have seen four *chrysalides* of this fly, which were uniformly found under the dung of horses, which leads to a suspicion that they also inhabit the stomach of this animal. The larva is at present unknown; but if it inhabited the *fauces* of the horse, it would produce such troublesome symptoms as could not easily escape the notice of those whose business it is to attend to the diseases of cattle. Such a disease, however, has never been described; nor after an extensive opportunity, both in the dead and living subject, have I ever seen a bot in the *fauces* of the horse. Perhaps the bots of the stomach, having crawled to the fauces in search of food, after the death of the animal, might have given rise to this idea; they may have even accidentally bred there; for there is little room to doubt, that these animals can live in any part whatever of the alimentary canal, or the passages leading to it. For a figure of this fly, see also the plate of the *œstri*.

'Of the *œstrus ovis*. About the middle of June I procured some full-grown larvæ of the *oestrus* ovis, from the inside of the cavities of the bone, which supports the horns of the sheep. They are nearly as large as those of the large horse-bot, of a delicate white color, flat on the under-side, and convex on the upper, having no spines at the divisions of the segments, though provided with two curved hooks at the small end. The other extremity is truncated, with a small prominent ring or margin, which seems to serve the same purpose, though in an inferior degree, as the lips of the Œ. equi and hæmorrhoidales, by occasionally closing over, and cleaning the horny plate of respiration. When this margin opens, after closing over the plates, a slight snap is sometimes heard, from the sudden admission of air. When young, those larvæ are perfectly white and transparent; except the two horny plates, which are black: as they increase in size, the segments of the upper side become marked with two brown transverse lines; and some spots are observable on the sides. They move with considerable quickness, holding with the *tentacula* as a fixed point, and drawing up the body towards them. On the under side of the *larva* is placed a broad line of dots, which, on examination with glasses, appear to be rough points, serving, perhaps, the double purpose of assisting their passage over the smooth and lubricated surfaces of these membranes, and of exciting also a degree of inflammation in them where they rest, so as to cause a secretion of lymph or pus for their food. I have mostly found these animals in the horns and frontal sinuses; though I have remarked that the membranes lining these cavities were hardly at all inflamed, while those of the maxillary sinuses were highly so. From this I am led to suspect they inhabit the maxillary sinuses, and crawl, on the death of the animal, into these situations in the horns and frontal sinuses. The breeds of these, like the Œ. *bovis*, do not appear confined to any particular season; for quite young and full-grown larvæ may be found in the sinuses at the same time. When full grown, they fall through the nostrils to the ground, and change to the *pupa* state, lying on the earth, or adhering by the side to a blade of grass. The fly bursts the shell of the pupa in about two months.

'The manner in which this species deposits its *ova*, which we have often seen, has not, we believe, ever been described; nor is it easy to see, though standing close to the animal at the time, exactly in what way this is accomplished, owing to the obscure color and rapid motions of the fly, and the extreme agitation of the sheep: but from the motions of the sheep afterwards, and the mode of defence it takes to avoid it, there is little doubt that the egg is deposited in the inner margin of the nostril. The moment the fly touches this part of the sheep, they shake their heads violently, and beat the ground with their feet, holding their noses, at the same time, close to the earth, and running away, earnestly looking on every side, to see if the fly pursues: they also may sometimes be seen smelling to the grass as they go, lest one should be lying in wait for them; which if they observe, they gallop back, or take some other direction, as they cannot, like horses, take refuge in the water: to defend themselves against its attacks, they have recourse to a rut, or dry dusty road, or gravel-pits, where they crowd together during the heat of the day, with their noses held close to the ground; which renders it difficult for the fly, who makes his attacks on the wing, to get at the nostril. I imagine, the nostril, from repeated attacks of the fly, and the consequent rubbing against the ground, becomes highly irritated and sore; which occasions their touch to be so much dreaded by the sheep.'

This writer afterwards observes 'there is no

medicine at present known that will detach them from the stomach, or intestines, though there are not wanting abundance of infallible nostrums for this purpose among the very numerous professors of horse medicine. An easy and effectual mode for the Œ. *equi*, is to destroy the eggs which are deposited on the hairs, and are readily seen and removed by a pair of scissars, or a brush and warm water.' It appears from Reaumur, that in France the grooms when they observe any bots about the anus of a horse or in its dung, thrust their hand into the passage to search for more: a precaution that gives great pain to the animal without any use; for when the bots are passing through the body they have ceased to feed. In Sweden, according to De Geer, they take the more effectual method of cleansing the mouths and throats of horses of these insects with a particular kind of brush.

In the sheep, says our English entomologist, it would be much more difficult to prevent or destroy them by any of these means, particularly if they are situated in the maxillary sinuses; as, in this case, even trepanning them would be insufficient, as they would probably lie concealed in the convolutions of the turbinated bones. Perhaps the removal of the sheep to a distant pasture, during the months of June and July, whilst the greatest part of the bots are yet on the ground, in a chrysalis state, and not bringing them on such ground again, till the setting in of winter, would be the means of destroying them most effectually; and this process, repeated for two or three years successively, in places where they are particularly troublesome, might prove eventually useful to the farmer: the Laplanders migrate annually with their rein-deer, on account of the bot which infests them.

On the other hand, he adds 'A physiological view of their effects will perhaps best justify their existence. The larvæ of the *æstri*, when applied under proper restrictions, and only to a certain extent, may be of greater utility than from our present very limited knowledge of them we are able to discover; but we may venture to remark, that their effect in keeping up a considerable degree of irritation in the membranes, on which they are situated, may perhaps not inaptly be compared to that of a perpetual issue, or blister. Nor is there wanting abundant proof of the utility of local irritations, in preventing the access, as well as in effecting the cure of disorders. We often see a formidable disease quickly removed by blistering the skin, or by irritating the mucous membranes of the stomach, or intestines, by a vomit or purge. The appearance of exanthematous eruptions on the skin, and the formation of local abscesses, from the same cause of partial irritation, often relieve a general disorder of the system. The mucous membranes, and the skin, possess this power, when irritated, in a more eminent degree than all the other parts of the body, and it is to these the larvæ of the *æstri* are applied. Irritating the membranes of the stomach, by such means, in other animals, would excite nausea and vomiting; but the horse, not possessing this power, his stomach is peculiarly fitted for the stimulus of such inhabitants.'

From the temporary madness produced in oxen by the attack of this genus, the Greeks applied the term to any sudden fit of passion or fury, calling such ebullitions, we are told, an 'œstrus.' In the third volume of the Linnæan Transactions, the species of this genus are all figured. Having dwelt so much at large upon the British species, we may now briefly describe all the others known.

*Cuniculi*. Black; wings brown; thorax black as far as the middle, behind, and base of the abdomen with yellowish hairs. It inhabits Georgia. It deposits its eggs in the skins of hares and rabbits. It is twice as large as the Œ. bovis. The sides of the abdominal segments are yellow; the body beneath is black. The larvæ are brown; every where rough, with very minute prickles.

*Buccatus*. Gray; face white, dotted with black. It inhabits Carolina, and is a large insect.

*Tarandi*. The wings of this species are immaculate; thorax yellow, with a black band; the abdomen is fulvous, tipt with black. It inhabits Lapland. Deposits its eggs on the back of rein-deer which produce larvæ often fatal to them.

*Trompe*. Wings white; body black, with cinereous hairs; thorax with a deep black band. It inhabits Lapland, and on the rein-deer.

No animal is on the whole, perhaps, so cruelly tormented by œstri as the rein-deer. Ten of these it is said will put a herd of 500 into the greatest consternation. They cannot stand still for an instant; but resort to puffing, blowing, changing their posture, stamping, and tossing themselves about in all directions. The ovipositor of the fly is similar to that of the ox-breeze, consisting of several tubular joints which slip into each other. It follows these noble animals over precipices, and through the valleys to the cloud-capped summit of the Alps.

*Antilopæ*. Wings with a brown band and dots; body hairy, tawny-gray; abdomen with three rows of blackish spots. It inhabits Asia, and deposits its eggs on the back of the antelope.

*Fasciculosus*. Downy, yellow; tail with three tufts of blackish hairs. This is a Siberian insect.

*Hominis*. The body of this species is entirely brown. It inhabits South America. It deposits its eggs under the skin, on the bellies of the natives. The larvæ, if it be disturbed, penetrates deeper, and produces an ulcer, which frequently becomes fatal. Gmelin was the first writer who included this species in the Linnæan system.

Genus 2. *Tipula*.—*Antennæ* generally filiform; *haustellum* having no vagina: the *mouth* armed with a short membranaceous *proboscis*, grooved on the back and receiving a bristle: *feelers* two incurved, equal, and filiform.

The smaller species of this genus are so much like gnats that the ablest entomologists have sometimes confounded them: but the structure and organs of the heart, the conformation of the mouth, &c., are decidedly different.

The larger species are found in our meadows during summer, having legs three times the length of their body. They are on the whole ugly

creatures. The head is small, and the neck short; the reticulated eyes of a greenish or purple color, and so large, that they cover almost the whole surface of the head. Reaumur supposes that two very lucid specks, on the anterior part of the breast, are eyes, though placed in so very singular a manner; the wings of this creature are long, but narrow, and seem scarcely well proportioned to its size; they are transparent, but have a slight cast of brown; and their ribs, when viewed by the microscope, appear beset with scales, or feathers, in the manner of those of the gnat kind. There are no ailerons, or petty wings at the origin of these; but they have two very fine balancers or mallets, with long pedicles, and round heads; the stigmata of the corslet are four. Each ring of the body is composed of two half cylinders, which are joined into one, by means of a membrane, which gives them room to distend or close up at pleasure.

The smaller kinds are numerous, and of great variety. These are frequent in all places, and at all seasons of the year; the spring shows us immense clouds of them, and even the coldest winter's day exhibits great numbers of them in the sun-shine. None of the larvæ have legs, but all have a regular scaly head, with two horns before and dentated behind. Those from which the larger tipulæ are produced live under ground, and are fond of marshy places, but any ground will do that is not often disturbed. They usually are found at about an inch under the surface, and are so plentiful in some places as greatly to injure the herbage. There is frequently found in the hollows of the stumps of old trees, a sort of earth which seldom produces any vegetables; yet the female flies of this species well know that their young will find a proper subsistence there; and there are usually found great numbers of them in these places.

Genus 3. *Musca.*—*Antennæ* generally short; mouth furnished with a soft exserted fleshy *proboscis;* two equal lips; *haustellum* bristled; two short *palpi,* generally, sometimes none.

Gmelin, in his edition of the Systema Naturæ, describes 550 species of this genus, which he divides into two families, viz. A, with two short feelers; and B, without any feelers. The latter, however, includes only eleven species of the vast number already mentioned. These grand sections are again separated into still smaller divisions. Thus the family A is divided into six sections, and that of B into two. Dr. Shaw, also, assorts this genus into divisions according to the form of the antennæ, which are either simple, without any lateral hair or plume; or armed, that is, furnished with a lateral hair or plume. These divisions, or sections, are still farther divided, according to the more or less downy or hairy appearance of the insects.

Although the number of known species in this genus is large, yet it is probable that it bears no proportion to the number that is still unknown, or that, at present, has not been arranged under specific characters. Mr. Harris, in his English Entomology (and England is not by any means productive of this insect, in comparison with some other countries), has described a greater number of species than Linnæus enumerated as existing in the world. The southern countries of Europe afford a much greater variety of species than those that are more north: in hot climates, in general, they are always numerous, and, in a multitude of instances, they multiply to a degree that is almost intolerable. The species are extremely diversified in their external form, their structure, their organisation, their metamorphosis, and all their habits. Generally the larvæ of this genus present a worm-like aspect, sometimes blunt at the anterior part and acute behind, and at others pointed at both ends. Several live in watery places and devour insects; others feed on corrupt animal matter, or on vegetable juices. The larva of musca vermileo preys on insects, and in its mode of entrapping its prey imitates the manners of myrmeleon formicarius, like that ferocious insect forming a circular den in the sands which it inhabits, and watching in an aperture at the bottom for the unwary insects that unfortunately wander too close to its cavity. But of all the peculiarities related of the musca tribe, nothing appears in any degree so extraordinary as the history of the larva of musca tenax, recorded on the authority of Linnæus, sanctioned by that of Fabricius. The larva is represented as a brown maggot with a long tail, which latter is extensile, and consists of a double tube, the exterior annulated into numerous segments, and the interior slender and terminated by a circle of hairs, surrounding a spiracle. This maggot is seen in muddy stagnant waters, drains, and other similar places; and is, according to Linnæus, a frequent inhabitant of the turbid pulp used in the operation of paper-making. Hence it is often in this state exposed to the action of the wooden mallets used in this process, as well as squeezed in the strongest presses, and yet it survives uninjured these seemingly destructive operations. This circumstance is described in a paper entitled Miracula Insectorum, inserted in Am. Acad. 3, p. 331, and though purporting to be the production of Emanuel Avelin, obtained the sanction of Linnæus. The same observation is confirmed in the Systema Naturæ.

A singular appearance is exhibited in the structure of the nervous system of musca putris. The brain is situated immediately above the origin of the œsophagus behind the head; it is very large in proportion to the rest of the body. The anterior part is notched, posterior rounded, and appears altogether as if formed of two lobes. A pair of nerves arises from the anterior part of the brain, proceeds forward, and is distributed to the mouth. These nerves become conspicuously large previously to distribution. Posteriorly the brain presents an aperture which affords a passage for the œsophagus: the nervous part, situated at the sides, may be regarded as cords which produce the medulla, and all below the œsophagus as the medulla itself. Musca tenax (Linn.) in the perfect state has a small brain, formed of two lobes, which are situated very near together, but distinguished by a longitudinal furrow; the anterior part produces a large nerve, which is afterwards distributed to the antennæ and the proboscis. Many of these tribes act the useful part of cleansing the face of nature

of corruption and various nuisances. No sooner does the life depart from an exposed animal body than the histers come and pierce the skin. Next follow the flesh-flies; some, that no time may be lost (as *musca carnaria*, &c.), depositing upon it their young already hatched; others (*M. caesar*, &c.), covering it with millions of eggs, whence, in a day or two, proceed innumerable devourers. 'An idea of the despatch made by these gourmands,' says Mr. Kirby, 'may be gained from the combined consideration of their numbers, voracity, and rapid development. One female of *M. carnaria* will give birth to 20,000 young; and the larvæ of many flesh-flies, as Redi ascertained, will in twenty-four hours devour so much food, and grow so quickly, as to increase their weight 200 fold! In five days after being hatched they arrive at their full growth and size; which is a remarkable instance of the care of Providence in fitting them for the part they are destined to act: for if a longer time was required for their growth, their food would not be a fit aliment for them, or they would be too long in removing the nuisance given in charge to them to dissipate. Thus we see there was some ground for Linné's assertion, under *M. vomitoria*, that three of these flies will devour a dead horse as quickly as would a lion.'

White wheat is very liable to the depredations of *M. pumilionis*. The stalks in which the larva is lodged do not advance in growth, but continue in a very dwarfish state, hence the insect itself has obtained its specific name. The stalks become yellow early in the summer, and soon after die away; but others usually spring up on the same root, and supply their place. This insect first attracted notice in our own country in 1791, when it excited a considerable degree of alarm, being mistaken for the Hessian fly, that has done so much injury in America. An account of this insect has been given by Mr. Markwick in the Linnæan Transactions; but the first description of the pumilionis, and of the mischief caused by it, was given in the Transactions of the Royal Academy of Sciences at Stockholm, for the year 1778, by M. Bjerkander, who discovered it on the young shoots of rye early in the spring.

*M. vermileo* is remarkable for practising a method exactly similar to that of the Hemerobius formicaleo, in order to obtain its prey; excavating a circular pit or cavity in the dry sand; concealing itself, waiting the arrival of any small insect which may happen to fall into it, and, after absorbing its juices, throwing out the exhausted remains to a considerable distance from the cavity. This larva seems to have been first observed and described by Reaumur, in the Memoirs of the French Academy for the year 1752. It assumes the state of a chrysalis by casting its skin, which of itself rolls to the hinder part of the body: the chrysalis is of a dull reddish color, and is rounded or clubbed at the upper part, suddenly tapering from thence to the extremity, and, after lying nine or ten days, it gives birth to the perfect insect. A writer in Nicholson's Journal calculates, that, in its ordinary flight, the common house-fly (*musca domestica L.*) makes with its wings about 600 strokes, which carry it five feet every second. But, if alarmed, he states their velocity can be increased six or seven fold or to thirty or thirty-five feet, in the same period. In this space of time a race-horse, it has been observed, could clear only ninety feet, which is at the rate of more than a mile in a minute. Our little fly, in her swiftest flight, will in the same space of time go more than the third of a mile.

Genus 4. *Tabanus.*—*Antennæ* cylindrical, short, and close, with seven articulations; the mouth has a fleshy *proboscis*, terminated by two equal lips; the rostrum is furnished with two awl-shaped *palpi*, placed on each side of, and parallel to, the proboscis. *Vagina* univalve, with five *setæ*. The tabani nourish themselves with the blood of horses and cattle; and some think the larvæ are aquatic, though De Geer asserts they live under ground. Gmelin, in his edition of the Linnæan System, enumerates thirty-eight species. These insects very much resemble the musca. Generally they have eyes of striking colors, which fade soon after their death; and dull, plain, bodies. *T. bovinus*, greenish eyes; marked down the back by a series of large, whitish, triangular spots, and on each side is a similar appearance, but less distinct than that of the dorsal row, is the largest of the British species, and, like others of its species, is seen generally in the hottest part of the day, during the middle and the decline of summer. It is very troublesome to cattle, and will attack man. Its larva is large and dusky yellowish, like that of a tipula, marked by transverse blackish streaks or rings; residing under ground in moist meadows, &c.; and changing into a cylindric brownish chrysalis, with a roundish or slightly pointed extremity, from which, within a month, proceeds the perfect insects.

Genus 5. *Culex* (the gnat.)—*Antennæ* filiform and approximate; *vagina* exserted, univalve and flexible; *setæ* five; *palpi* two, comprising three articulations.

These insects subsist on the blood and juices of larger animals, which they suck by means of their proboscis. In the larva state they live in stagnant waters, and in such neighbourhoods, therefore, this insect abounds. They have a small cylindrical respiratory tube near the tail. The pupa is incurvated and subovated with respiratory tubes near the head. The larvæ are very curious in their conformation: the body consists of nine segments, which become gradually smaller from the head towards the extremity. The head is very large, and furnished on each side with a pair of pointed forceps, or hooks, with which it seizes its prey. The tail terminates in a tubular opening, at the tip of which are four ovate scales, two of which exceed the others in size. At the end of the body, near the tail, is a small elevated respiratory tube, which the creature frequently raises above the surface of the water, while the head remains suspended downwards. The color of the larva is brownish, extremely pellucid, and its motions remarkably lively. When first hatched, the larva is extremely minute, and in the space of fourteen days from its birth attains its full size, its length being then about half an inch.

*C. hæmorrhoidalis* (Brown), abdominal margin fringed with rufous hairs (Fabr.), is the largest of the gnat tribe, and a native of Cayenne. The antennæ are beset with thick verticillate hairs, the first joint naked, and of a shining blue color; head brown, with the crown shining blue; legs blue, thighs testaceous beneath; wings white, with a brown rib.

*C. pipiens*—Cinereous with eight brown rings (Linn. Fn. Suec., &c.), is the common gnat of this country, and inhabits Europe and the greater part of Asia and America, about watery places. It is every where known by its shrill buzzing noise, and severe puncture. It appears in immense numbers in Lapland during their summer. The antennæ of the male are pectinated. According to Kalm the mosquitos are a variety of this insect.

Humboldt (Personal Narrative) observes that the geographical description of the culiers of South America does not at all appear to be dependant on the heat of the climate, the excess of humidity, or the thickness of the forests, but on local circumstances difficult to characterise. He says, that almost every stream has its peculiar species.

We have noticed in our introduction some of the ravages of this tribe.

Several species of this genus have a severe bite, but few are to be compared to the common gnat (*culex pipiens*, L.). In certain districts of France, Reaumur informs us that he has seen people whose arms and legs have become quite monstrous from wounds inflicted by gnats; and in some cases in such a state as to render it doubtful whether amputation would not be necessary. In the neighbourhood of the Crimea, the Russian soldiers are obliged to sleep in sacks to defend themselves from the mosquitos; and even this is not a sufficient security, for several of them die in consequence of mortification produced by the bites of these furious bloodsuckers.

In this country gnats follow us to all our haunts, intrude into our most secret retirements, assail us in the city and in the country, in our houses and in our fields, in the sun and in the shade: nay, they pursue us to our pillows, and either keep us awake by the ceaseless hum of their droning pipe, and their incessant endeavours to fix themselves upon our face, or some uncovered part of our body. In the year 1736, we are told they were so numerous, that vast columns of them were seen to rise in the air from Salisbury cathedral, which at a distance resembled columns of smoke, and occasioned many people to think that the cathedral was on fire. A similar occurrence, in like manner giving rise to an alarm of the church being on fire, took place in July 1812, at Sagan in Silesia. In the following year at Norwich, in May, at about six o'clock in the evening, the inhabitants of that city were alarmed by the appearance of smoke issuing from the upper window of the spire of the cathedral, for which at the time no satisfactory account could be given, but which was most probably produced by the same cause. And in the year 1766, in the month of August, they appeared in such incredible numbers at Oxford as to resemble a black cloud darkening the air and almost totally intercepting the rays of the sun. One day, a little before sunset, six columns of them were observed to ascend from the boughs of an apple tree, some in a perpendicular and others in an oblique direction to the height of fifty or sixty feet. Their bite was so envenomed, that it was attended by violent and alarming inflammation: and one when killed usually contained as much blood as would cover three or four square inches of wall. Spenser seems to have witnessed a similar appearance of them :—

As when a swarm of gnats at eventide
Out of the fennes of Allan doe arise,
Their murmuring small trumpets sownden wide,
While in the air their clustering army flies,
That as a cloud does seem to dim the skies ;
Ne man nor beast may rest or take repast
For their sharp wounds and noyous injuries.
Till the fierce northern wind with the blustering blast
Doth blow them quite away, and in the ocean cast.

Our readers have often heard of the annoyances of the mosquito and gnat tribes in hot countries: but they seem endowed with the privilege of resisting any degree of cold, and of bearing any degree of heat. In Lapland their numbers are so prodigious as to be compared to a flight of snow when the flakes fall thickest, or to the dust of the earth. The natives cannot take a mouthful of food, or lie down to sleep in their cabins, unless they be fumigated almost to suffocation. In the air you cannot draw your breath without having your mouth and nostrils filled with them; and unguents of tar, fish-grease, or cream; nets steeped in fetid birch oil, are scarcely sufficient to protect even the case-hardened cuticle of the Laplander from their bite. This seemingly unfavorable circumstance may be considered, in another point of view, however, as constituting one of the advantages of the country, being, in the words of Linné, *Lapponum calamitas felicissima;* since the legions of larvæ which fill the lakes of Lapland form a delicious and tempting repast to innumerable multitudes of aquatic birds; and thus contribute to the support of the very nation which they so strangely infest.

The mosquito, so much dreaded by the inhabitants of the West Indies, and America, is supposed to be a variety of the common European gnat, which derives additional vigor from the warmer and moister atmosphere of those regions.

Genus 6. *Empis.*—*Antennæ* setaceous; *mouth* furnished with an inflected haustellum and proboscis; *haustellum* with a single-valved sheath and three bristles; feelers short and filiform.

This genus is carnivorous, and subsists on flies and other small insects, which they seize with their feet, and pierce with their rostrum, to suck the blood and juices. Some are found on flowers, in the winged state. None of the larvæ are known, and little of its economy.

Genus 7. *Conops.*—*Antennæ* clavated, the clava accuminated; *mouth* furnished with a projecting geniculate proboscis.

The insects of this genus are found remarkably active in gardens, where they subsist on the nectareous juices of flowers. The head is large

*and nearly hemispherical; the eyes large, and almost oval, and the antennæ formed of three articulations, the middle one of which is long and cylindrical, the last joint terminating in a little point. The larvæ are unknown.* The males have on the antepenultimate ventral segment a singular process, varying in length and shape in the different species, standing nearly at right angles with the belly convex towards the trunk and concave towards the anus. De Geer supposes that this, with the anal extremity, forms a forceps with which this fly seizes its female.

The genus is divided in the Linnæan system into two families; the first of which includes those species which have the sheath of the sucker single-valved, abbreviated, and enclosing a single bristle; the other those with the sheath consisting of two equal valves, and which is geniculated both at the base and in the middle. The latter are the myopæ of Fabricius. In the Fabrician Supp. Ent. Syst. the Linnæan conops subcoleoptratus is described under the new genus, thereva.

Genus 8. *Asilus.—Antennæ* filiform; *mouth* furnished with a straight, horny, bivalve haustellum, gibbous at the base.

The chief food of these insects is supplied by various species of the dipterous and lepidopterous orders. But they also attack cattle. They are always upon the chase: they seize their prey with their anterior legs and immediately apply their haustellum. When at rest their wings are generally incumbent on the abdomen, which is long, small, and often hairy toward the feet, which terminate in small claws. Their larvæ feed in the earth, on the roots of plants: they change into a *pupa coarctata* beset with setæ.

These are the wasp flies of some writers; the species described by Gmelin are very numerous, of which the chief are, *A. algirus* which has the body entirely brown, and inhabits Africa. Fabricius and Gmelin. *A. æstuans* is a native of North America, is cinereous, and has the three last segments of the abdomen white. Linné and Gmelin. *A. æstivus* inhabits Europe; the color is cinereous, with three black lines on the thorax; legs black; shanks testaceous. Schrank. Scopoli describes a variety in which the legs are entirely black. The motions of *A. crabroniformis*, the hornet-fly, are curious. This insect lives upon the smaller flies. When we are walking it will alight just before us, as soon as we come up it flies a little further, and will thus be our avant-courier for the whole length of a field. This usually takes place when a path lies under a hedge; and perhaps the object of this manœuvre may be the capture of prey. Our motions may drive a number of insects before us; a. ! so be instrumental in supplying it with a meal. Other species of the genus are said by Mr. Kirby to have the same habit.

Genus 9. *Bombylius* (humble-bee).—*Antennæ* subulated, united at the base; *mouth* having a long setaceous, straight, bivalve haustellum; *valves* unequal, with three setæ; two short hairy *palpi*.

The humble-bee seizes on the nectareous juice of flowers, which it sucks flying. Ray reckons nineteen species, but Linnæus only five. See BOMBYLIUS.

The habits of these animals, which form a connecting link between the wasp and hive-bee tribes, have been well illustrated by Reaumur and M. P. Huber. The population of their nests may be divided into four orders of individuals: the larger females; the small females; the males; and the workers. The *larger females*, like the female wasps, are the original founders of the republic. They are often so large that by the side of the small ones, or the workers, which in every other respect they exactly resemble, they look like giants opposed to pigmies. They are excluded from the pupa in the autumn; and pair in that season, with males produced from the eggs of the small females. They pass the winter under ground, and, as appears from an observation of M. P. Huber, in a particular apartment, separate from the nest, and rendered warm by a carpeting of moss and grass, but without any supply of food. Early in the spring (for they make their first appearance as soon as the catkins of the sallows and willows are in flower), like the female wasps, they lay the foundation of a new colony without the assistance of any neuters, which all perish before the winter. In some instances, however, if a conjecture of M. de la Billardiere be correct, these creatures have an assistant assigned to them. He says, at this season (the approach of winter) he found in the nest of *apis sylvarum* (Kirby) some old females and workers, whose wings were fastened together to retain them in the nest by hindering them from flying; these wings in each individual were fastened together at the extremity, by means of some brown wax. The large female, besides having the care of the young brood, and the collecting of honey and pollen, is principally employed in the construction of the cells in which her eggs are to be laid; which M. P. Huber seems to think, though they often assist in it, the workers are not able to complete by themselves. So rapid is the female in this work, that to make a cell, fill it with pollen, commit one or two eggs to it, and cover them in, requires only the short space of half an hour. Her family at first consists only of workers, which are necessary to assist her in her labors; these appear in May and June; but the males and females are later, and sometimes are not produced before August and September.

A *small* kind of *female* amongst the humble bees, must now be noticed. Like those of the wasps and hive-bees, these minor queens produce only male eggs, which come out in time to fertilise the young females that found the vernal colonies. M. P. Huber suspects that, as in the case of the female bee, it is a different kind of food that developes their ovaries, and so distinguishes them from the workers. They are generally attended by a small number of males, who form their court.

M. Huber, watching at midnight the proceedings of a nest, which he kept under a glass, observed the inhabitants to be in a state of great agitation: many of these bees were engaged in making a cell; the queen-mother of the colony, ... may be called, who is always extremely jealous of her pigmy rivals, came and drove them away from the cell;—she in her turn

driven away by the others, which pursued her, beating their wings with the utmost fury, to the bottom of the nest. The cell was then constructed, and some of them at the same time oviposited in it. The queen returned to the charge, exhibiting similar signs of anger; and chasing them away again, put her head into the cell, when seizing the eggs that had been laid, she was observed to eat them with great avidity. The same scene was again renewed, with the same issue. After this one of the small females returned and covered the empty cells with wax. When the mother-queen was removed, several of the small females contended for the cell with indescribable rage, all endeavouring to lay their eggs in it at the same time. These small females perish in the autumn.

Of an intermediate size, between the large and small females, the *males* may be known, by their longer, more filiform, and slenderer antennæ; by the different shape, and by the beard of their mandibles. Their posterior tibiæ also want the *corbicula* and *pecten* that distinguish the individuals of the other sex, and their posterior plantæ have no auricle. We learn from Reaumur that the male humble bees are not an idle race, but work in concert with the rest to repair any damage or derangement that may befal the common habitation.

The first fruits of the queen-mother's vernal parturition are the *workers*, and they assist her as soon as they are excluded from the pupa, in her various labors. To them also is committed construction of the waxen vault that covers and defends the nest. When any individual larva has spun its cocoon and assumed the pupa, the workers remove all the wax from it; and as soon as it has attained to its perfect state, which takes place in about five days, the cocoons are used to hold honey or pollen. When the bees discharge the honey into them, upon their return from their excursions, they open their mouths, and contract their bodies, which occasions the honey to fall into the reservoir. Sixty of these honey-pots are occasionally found in a single nest, and more than forty are sometimes filled in a day. In collecting honey, humble-bees, if they cannot get at that contained in any flower by its natural opening, will often make an aperture at the base of the corolla, or even in the calyx, that they may insert their proboscis in the very place where nature has stored up her nectar. M. Huber relates a singular anecdote of some hive-bees paying a visit to a nest of humble-bees placed under a box not far from their hive, in order to steal or beg their honey; which places in a strong light the good temper of the latter. This happened in a time of scarcity. The hive-bees, after pillaging, had taken almost entire possession of the nest. Some humble-bees which remained in spite of this disaster, went out to collect provisions; and bringing home the surplus after they had supplied their own immediate wants, the hive-bees followed them, and did not quit them till they had obtained the fruit of their labors. They licked them, presented to them their proboscis, surrounded them, and thus at last persuaded them to part with the content of their honey-bags. The humble-bees after this flew away to collect a fresh supply. The hive-bees did them no harm, and never once showed their stings; so that it seems to have been persuasion rather than force that produced this singular instance of self-denial. This remarkable manœuvre was practised for more than three weeks; when the wasps being attracted by the same cause, the humble-bees entirely forsook the nest. The workers are the most numerous part of the community.

M. Huber gives one most astonishing instance of the ingenuity of these insects, which we cannot omit. He put under a bell-glass about a dozen humble-bees without any store of wax, along with a comb of about ten silken cocoons, so unequal in height that it was impossible the mass should stand firmly. Its unsteadiness disquieted the humble-bees extremely. Their affection for their young led them to mount upon the cocoons for the sake of imparting warmth to the enclosed little ones, but in attempting this the comb tottered so violently that the scheme was almost impracticable. To remedy this inconvenience, and to make the comb steady, they had recourse to a most ingenious expedient. Two or three of the bees got upon the comb, stretched themselves over its edge, and, with their head downwards, fixed their fore feet on the table upon which it stood, whilst with their hind feet they kept it from falling. In this constrained and painful posture, fresh bees relieving their comrades when weary, did these affectionate little insects support the comb for nearly three days! At the end of this period they had prepared a sufficiency of wax with which they built pillars that kept it in a firm position: but by some accident afterwards they got displaced, when they had again recourse to their former manœuvre for supplying their place; on this operation they perseveringly continued, until M. Huber, pitying their hard case, relieved them by fixing the object of their attention firmly on the table.

Sir George Mackenzie makes the following observations on the vision of humble-bees, which seem to illustrate other peculiarities of their economy. 'Happening to observe a number of humble bees entering the door of a dark outhouse, I had the curiosity,' says he, 'to examine where they had their nest, and I went in, leaving the door half open. I saw the bees coming from a hole in the floor near the wall, and the instant they arrived at the margin of the light admitted by the door, they took wing, although at the distance of several feet from the spot from which they usually rose into the air. I varied the position of this margin or division between the light and darkness, but this made no difference, the bees in every case beginning their flight as soon as they reached the light. While the door was open, I noticed that the bees which arrived appeared to be completely puzzled by the alteration of the position of the door. Some of them alighted, and wandered about in all directions on the floor, crossing repeatedly the direct path to the nest, but never following it. A very few, by accident apparently, got close to the wall, and reached the nest. Those which chanced to alight near the same part of the door by which they had been accustomed to enter, immediately

went through, but from the position of the door, they passed in the direction opposite their nest. As soon as they got within the door, they became as much puzzled as the others. Many flew away, as if to try a new route homewards. As soon as I shut the door, remaining in the inside, the bees on entering, turned directly towards the hole in the floor; and none of them going, attempted to fly till they reached the light. I was cruel enough to repeat the experiment several times, and each time to keep the homeward-bound laborers in suspense and difficulty for some minutes. These facts seem to prove that bees, although by some means they rapidly and unerringly traverse the air, cannot discover a track on the ground, when the usual marks are removed. They did not discover it even when they met other bees coming out, a proof that they have no means of communication, but that each insect depends on its own instinct exclusively.

'I made an experiment on the hive-bee, by lifting the hive, and placing it a few yards, three or four, from the place where it usually stood. I was of course stung for my pains; but I had the satisfaction to see the returning bees pass quite close to the hive where it now stood, and go on to the spot where it had stood when they left it. They seemed not only puzzled but angry, and I was obliged to keep at a respectful distance. When the hive was replaced, those bees that had left it after its first removal, stopped for a little at the place where they had quitted it; but in a few minutes all seemed to be quiet and regular as formerly. I removed another hive in the evening, when none of the inhabitants were abroad, and in the morning there was no resumption of confusion whatever.'—*Edinburgh Philosophical Journal.*

Genus 10, *Hippobosca.*—*Antennæ* filiform; *mouth* with a short, cylindrical, bivalve *haustellum*; the *valves* equal; *feet* armed with several claws; the *body* flat and hard. Scopoli adds, that the rostrum has only one bristle. Geoffroy observes, that the hippoboscæ are the only dipterous insects that want stemmata, except the culices, and that their antennæ are setaceous, and composed of a single hair. According to Schæffer, the abdomen is as broad as the thorax.

Reaumur has denominated the hippoboscæ, 'mouches arraignées.' It is also called in Normandy 'mouches bretonnes;' and elsewhere, 'mouches d'Espagne.' In England they bear the name of spider-flies, horse-flies, the largest species being extremely troublesome to horses. They abound in woods and marshy places, and are generally found attached to the bodies of quadrupeds and birds, on the juices of which they live. In the act of feeding they thrust their acute proboscis into the skin, which occasions a smart like a flea-bite, and they become so firmly attached by their numerous claws, that it is scarcely possible by any effort to remove them, without tearing away portions of the flesh. The species are not numerous. They do not appear to have any larva; but are the produce of an egg which partakes of the two-fold character of being at the same time an egg and a pupa. The female, at distant intervals, deposits an egg, which in magnitude is nearly equal to the whole bulk of its parent's body: the figure of it is oval, with an excavated depression at the lower end; the color, at its first exclusion, is milk-white, except a large black spot on the fore part, from which it afterwards becomes brown, and then of a jet black, with a very high polish. This change in color marks the progressive advancement of the insect enclosed towards its maturity of formation, the parts becoming gradually developed. The egg deposited in autumn acquires its deepest color in the summer following, at which time the insect bursts from its confinement in the winged form. The principal species is, *H. equina.* Wing-obtuse; thorax variegated; feet armed with four claws. Linn. (*horse spider-fly*, Donov. Br. Ins.) It inhabits Europe, and is of a disgusting form, flat, hard, and not easily killed by pressure. The head is brown; thorax brown, varied with yellowish, and a band of the same down the middle; wings hyaline, with a brown spot near the outer margin; legs annulated with yellow and brown. Length about three-quarters of an inch. No insect is more tormenting to the horse than this. Attaching itself frequently under the belly, behind the hind legs, it will goad the quickest animal to madness; its movements are generally sideways or backward, like those of the crab.

### Order VII.—Aptera.

The simple definition of this order is, wings, none; the genera are variously divided. Linné himself included, as we have stated, the Crustacea in this part of his system. The older writers, Gesner, Aldrovandus, and Johnson, had placed the crustacea between the fishes and mollusca. Fabricius divided the crustacea from insects, and formed several distinct classes for their reception. In the Supplement to his Entomologia Systematica, the following is given as his final arrangement:—

Class *polygonata.* Many maxillæ within the lip.

Genus 1. Oniscus, 2. Ligia, 3. Idotea, 4. Cymothoa, 5. Monoculus.

Class *kleistagnatha.* Many maxillæ, closing the mouth. Lip none.

Genus 1. Cancer, 2. Calappa, 3. Ocypode, 4. Leucosia, 5. Parthenope, 6. Inachus, 7. Dromia, 8. Dorippe, 9. Orithyia, 10. Portunus, 11. Matuta, 12. Hippa, 13. Symethis, 14. Limulus.

Class *exochnata.* Many maxillæ outside the lip, covered by the palpi.

Genus 1. Albunea, 2. Scyllarus, 3. Palinurus, 4. Palæmon, 5. Alpheus, 6. Astacus, 7. Penæus, 8. Crangon, 9. Pagurus, 10. Galathea, 11. Squilla, 12. Posydon, 13. Gammarus.

The most prejudiced of Linné's followers, says Dr. Leach, now admit that they have characters sufficient to establish them as a distinct class. 'Crustacea,' says Mr. Kirby, 'agree with *insecta* in having a body divided into segments, furnished with jointed legs, compound eyes, and antennæ. Their nervous system also is not materially different, and they are both oviparous. They differ from them in having the greater insections of the body less strongly marked; in the greater number of legs on the trunk, the anterior ones performing the office of maxillæ; in their eyes

usually on a moveable footstalk; their palpigerous mandibles; and their four antennæ, at least in the great majority. But the principal difference consists in the internal organisation and the fountains of vitality; for the *crustacea* have a double circulation, the fountain of which is a heart in the middle of their thorax. They have too a kind of gizzard and liver, at least the *decapods*, and their respiration is by gills. Genuine insects terminate their existence after they have laid their eggs; but the *crustacea* live longer and lay more than once.' See our articles CANCER, MONOCULUS, ONISCUS, &c.

Although the adjective apterous is frequently applied more generally, no insect, it should be observed, can be included in the aptera of the Linnæan system, unless both sexes, when arrived at their last state of being, are destitute of wings. No insect of this order, except the common flea, is supposed to undergo those successive changes which are usual in most other insects. They are almost entirely produced from the egg in their perfect form, and cannot therefore be said to have any larva. In the flea, however, the small worm which corresponds with the larva in other insects is clearly ascertained; and if we may place sufficient reliance on the evidence of certain naturalists, one or two more of the apterous genera exist for a short period in a state somewhat analogous either to the larva or pupa. Leuwenhoek observed that the mite was oviparous, laying very small oval whitish eggs, from which proceeded the young animals, resembling their parents in all respects, except in the number of their legs, these being only six in number, instead of eight; and after they cast their skin, another pair of legs appear, a fact that evidently implies two periods of transformation, the first of which may be compared with that of larva. An advancement, or progressive increase in the number of feet, is also well known to take place in species both of the julus and scolopendra genera, after they are produced from the egg state. The julus fabulosus, when first excluded, is furnished with three pairs of legs, which are situated at each side near the head; some days after about fourteen become visible, and the remainder, to the amount of 120 on each side, are gradually acquired afterwards. The same remark will apply to certain species, if not the whole of the scolopendra genus. Scorpions are produced by the female parent in a living state; they are at first very small and white, and become of a darker hue in a few days; these, like the spiders cast their skin as they increase in size.

Our countryman, Dr. Leach, has contended that the first five of the Linnæan genera of this order, are the only insects, properly speaking, to be found in it, i. e. the lepisma, podura, pediculus, pulex, and termes. The genera, acarus, phalangium, aranea, and scorpio, he refers to his class *arachnoida*. Genera cancer, monoculus, and oniscus, to the *crustacea;* scolopendra and julus, to *myriapoda*. We adopt the names of these classes in our subdivision of this order, but make no further alteration in the system of Linné.

## Class I.—INSECTA.

Dr. Leach defines this class as having uniformly six legs; a head distinct from the body, and furnished with two antennæ: they are all produced from eggs. Some undergo no metamorphosis, others but a partial change, whilst the remainder pass through three stages of existence, after having been hatched from the egg.

Genus 1. *Lepisma*.—Gmelin, to whom the admirers of Linné are indebted for one of the best editions of the Systema Naturæ, defines this genus as having four *palpi*, two of which are setaceous, and two capitated; the *lip* membranaceous, roundish, and emarginated; *antenna* setaceous; *body* imbricated with scales; *tail* ending in setaceous bristles; legs six, and formed for running.

This character combines the more essential parts of that of Fabricius. Lamarck proposes further alteration; and Latreille, in whose arrangement they form the first family (lepismenæ) of the order thysanoura, divides them into two distinct genera: lepisma and machilis. The true lepisma, according to the new definition, has the antennæ inserted between the eyes, the body flat, and the tail ending in three equal bristles.

This genus walks and runs. In the genus machilis (which moves by skipping) the antennæ are seated under the eyes, the body convex, and the middle bristle of the tail larger than those at the sides. All the species, except the *L. saccharinum*, are natives of Europe. In their various states of growth they prey on decayed wood, and moist or rotten substances; and are most commonly found in damp cellars, neglected water-courses, and similar situations.

*L. saccharinum* is scaly, silvery; tail triple, and originally a native of America, whence it has been introduced and naturalised in Europe. The antennæ are as long as the body, which is oblong and tapering; tail terminating in three bristles, and two pairs of smaller ones beneath. It secretes itself among books, old furniture, &c., and runs, when disturbed, with great agility: it is often found in sugar, and is thus supposed to have found its way to Europe. In some places of this country it is common under stones; its eight pairs of strings (one on each ventral segment of the abdomen) give it, says Kirby, a wonderful power of leaping. The *L. polypoda* also, inhabiting among stones and rubbish on sandy sea-shores, possesses the faculty of leaping in the same way to a prodigious height. Linné only described another species, viz. *L. terrestris*: naked, tail triple.

Gmelin notices the close affinity this species bears to the podura tribe. It is entirely white and cylindrical, with obtuse antennæ half the length of the antennæ. Fabricius adds L. villosa, brown, with a triple, villous tail, a native of China; *L. collaris*, black, with a snowy band on the neck and end of the abdomen: tail triple and villous, an inhabitant of the South American Islands: and *L. lineata*, tail triple, body brown, with two white fillets. Natives of Helvetia.

Genus 2. *Podura*.—*Antennæ* filiform; *palpi*, four, subclavate; *lip* bifid; two *eyes*, composed of eight facets; the *body* scaly; *tail* forked, bent under the body and acting as a spring; from which the genus has its name, podura or spring-tailed: it has six legs, formed for running.

There are thirty species enumerated by Gmelin, all comparatively small insects, found in general in damp places, under stones, on the bark of trees, &c. When disturbed they suddenly spring to a small distance by the help of their spring which is ordinarily doubled under the abdomen, and thrown out during the act of leaping. They feed on the leaves of various plants. Their spring will even enable these animals to leap on water. A minute species *P. aquatica* is sometimes found in boundless numbers on the water of hollows and ruts. When disturbed they resemble in their leaping up the appearance of steel-filings or gunpowder suddenly thrown into motion. One species, *sminthurus fuscus*, Lat. besides the caudal fork has another singular organ which seems designed to prevent its falling off from a perpendicular surface. Between the ends of the fork is an elevated cylinder or tube from which this little creature can protrude at pleasure two long filiform transparent threads, covered with a slimy secretion.

Genus 3. *Pediculus* (the louse).—*Antennæ*, length of the thorax; *mouth* with a retractile recurved sucker without proboscis; no palpi; two *eyes*; the *abdomen* depressed; six *legs* formed for running.

The insects of this genus live by extracting animal juices. Some infest the bodies of quadrupeds, others of birds, and some even of insects themselves. It must, however, be observed, that many insects, infesting other animals, have sometimes been referred to the genus pediculus, which, in reality, belong to those of acarus, monoculus, &c. Gmelin enumerates sixty-six species.

Leuwenhoeck has proved that the nits or eggs of ordinary lice are not hatched until the eighth day after they are laid; and that they never commence laying them until a month old: he also ascertained that a single louse may in eight weeks witness the birth of 5000 descendants. A pedicular disease (*phthiriasis*), is said to have carried off Antiochus Epiphanes, Sylla, two of the Herods, and the emperor Maximian. Mr. Kirby, however, disputes this, because, as he contends, this genus is never subcutaneous, for which he quotes the authority of Mead and Willan. 'If these observations be allowed their due weight, he continues, it will follow, that a disease produced by animals residing under the cuticle cannot be a true phthiriasis, and therefore the death of the poet Alcman, and of Pherecydes Syrius the philosopher, mentioned by Aristotle, must have been occasioned by some other kind of insect.' For speaking of the lice to which he attributes these catastrophes, he says that they are produced in the flesh in small pustule-like tumors, which have no pus and from which when punctured they issue. For the same reason, the disorder which Dr. Heberden has described in his Commentaries, from the communications of Sir E. Wilmot, under the name of *morbus pedicularis*, must also be a different disease, since, with Aristotle, he likewise represents the insects as inhabiting tumors, from which they may be extracted when opened by a needle. He says, indeed, that in every respect they resemble the common lice, except in being whiter; but medical men, who were not at the same time entomologists, might easily mistal an acarus for a pediculus. Dr. Willan, in o case of *prurigo senilis*, observed a small numbe of small insects on the patient's skin and line They were quick in their motions, and so minut that it required some attention to discover them He took them at first for small pediculi; bu under a lens they appeared to him rather to b a nondescript species of pulex; yet the figur he gives has not the slightest likeness to th latter genus, while it bears a striking resemblanc to the former. It is not clear whether hi draughtsman meant to represent the insect wit six or eight legs: if it had only six, it was pro bably a pediculus; but if it had eight, it woul form a new genus between the *acaridæ* and th hexapod *aptera*. Dr. Bateman in reply to som queries put to him at my request, by our com mon and lamented friend Dr. Reeve, relates tha he understood from Dr. Willan, in conversation that the insect in question jumped in its motion This circumstance he regards as conclusiv against its being a pediculus; but such a conse quence does not necessarily follow, since it no seldom happens that insects of the same genu either have or have not this faculty; for instance cyphon hemisphæricus, acarus scabiei, &c. Dr Willan has quoted with approbation two case from Amatus Lusitanus, which he seems to think correctly described as phthiriasis. In one o them, however, which terminated fatally, the cir cumstances seem rather hyperbolically stated— I mean, where it is said that two black servants had no other employment than carrying baskets full of these insects to the sea!!'

Genus 4. *Pulex* (the flea).—*Antennæ* projecting, and moniliform; no *palpi* or maxillæ; a long, inflected *proboscis*, covered at the base with two ovate laminæ; the *sheath* two-valved, five-jointed, and containing one bristle; *lip* rounded, and fringed with reflected prickles; *eyes* two; *abdomen* compressed; *legs* six, formed for leaps.

This genus is oviparous, and the common species, P. *irritans*, deposits its nits on animals that afford them a proper food; these, being round and smooth, usually slip straight down, unless detained by folds, or other inequalities of clothes, hairs, &c. They lay their eggs, not all at once, but ten or twelve in a day for several days successively, which eggs will be afterwards found to hatch successively in the same order. These eggs first produce a white worm, of a shining pearl color, which feeds on the scurfy substance of the cuticle, the downy matter gathered in the piles of clothes, or like substances. In a fortnight they come to a tolerable size, and are very lively and active: if at any time disturbed, they roll themselves into a kind of ball. Soon after they creep, after the manner of silkworms, with a very swift motion. When arrived at full size, they hide themselves as much as possible, and spin a silken thread out of their mouth, wherewith they form a small round bag, or case, white within as paper, but without always dirty. Here, after a fortnight's rest, the animalcule bursts out, transformed into a perfect flea; leaving its exuviæ in the bag. While it remains in the bag it is milk-white, till the second day before its eruption; when it becomes colored, grows

hard, and gets strength; so that, upon its first delivery, it springs nimbly away.—*Phil. Trans.* No. 249.

The flea may easily be dissected in a drop of water, and by this means the stomach and bowels, with their peristaltic motion, may be discovered, very plainly, as also their testes and penis, with the veins and arteries, though minute beyond all conception. Mr. Leuwenhoeck affirms also, that he has seen innumerable animalcules, shaped like serpents, in the semen masculinum of a flea. Baker's Micros. p. 191, and 194. On dissection, this animal is far from being a disagreeable object. It is covered with curious black shelly scales or plates, admirably jointed, and folded one over another in such a manner as to comply with all the nimble motions of the creature. They are all also curiously polished, and set round the edges with short spikes in a very regular manner. Its neck is finely arched; the head also is ry extraordinary; for from the snout part of it there proceed the two fore-legs, and between these is placed the piercer or sucker, with which it penetrates the skin to obtain its nutriment. Its eyes are large and handsome, and it has two short horns or feelers. It has four other legs joined all at the breast. These, when it leaps, fold short one within another, and, then exerting their spring at the same instant, they carry the creature to a surprising distance. Aristophanes ridicules Socrates for having measured the leap of a flea. (Nubes, act i. sc. 2). Scientific men have however persevered in ascertaining the wonderful power and strength of this little creature, which will leap two hundred times the length of its own body, unaided, as we see, by wings.

Mr. Kirby (vol. iv. p. 188) furnishes us with the following anecdotes of the strength of this species.—Mouffet relates that an ingenious English mechanic, named Mark, made a golden chain of the length of a finger, with a lock and key, which was dragged by a flea;—he had heard of another that was harnessed to a golden chariot, which it drew with the greatest ease. Another English workman made an ivory coach with six horses, a coachman on the seat with a dog between his legs, a postilion, four persons in the coach, and four lacqueys behind—which also was dragged by a single flea. At such a spectacle one would hardly know which most to admire, the strength and agility of the insect, or the patience of the workman. Latreille mentions a flea, of a moderate size, dragging a silver cannon on wheels, that was twenty-four times its own weight, which, being charged with powder, was fired without the flea appearing alarmed.

The legs have several joints, are very hairy, and terminate in two long and hooked sharp claws. The flea lodges its piercer or sucker between its fore legs, and includes a couple of darts or lancets, which, after the piercer has made an entrance, are thrust farther into the flesh, to make the blood flow from the adjacent parts, and occasion that red round spot, with a hole in the centre of it, vulgarly called a flea-bite. The piercer, its sheath opening sideways, and the two lancets within it, are very difficult to be seen, unless the two fore-legs, between which they are hid, be cut off close to the head: for the flea rarely puts out its piercer, except at the time of [illegible] keeps it folded inwards; and the [illegible] seeing it is by cutting off first the head, [illegible] the fore-legs, when it is usually thrust [illegible]t in convulsions.

'Dear Miss,' said a lively old lady to a fri[illegible]d of mine (says Mr. Kirby), who had the misfortune to be confined to her bed by a broken limb, and was complaining that the fleas tormented her, 'dont you like *fleas?* Well, I think they are the prettiest little merry things in the world.—I never saw a dull flea in all my life.' The celebrated Willoughby kept a favorite flea; which used at stated times to be admitted to suck the palm of his hand; and enjoyed this privilege for three months, when the cold killed it. And Dr. Townson, from the encomium which he bestows upon these vigilant little vaulters, as supplying the place of an alarum and driving us from the bed of sloth, would seem to have regarded them with feelings much more complacent than those of Dr. Clarke and his friends, when their hopes of passing 'one night free from the attacks of vermin,' were changed into despair by the information of the laughing sheik, 'that the king of the fleas held his court at Tiberias:' or than those of M. M. Lewis and Clarke, who found them more tormenting than all the other plagues of the Missouri country, where they sometimes compel even the natives to shift their quarters.

P. penetrans, the chigoe of South America, has a *proboscis* as long as the body. The body is of a reddish-brown color; abdomen of the female, when gravid, orbicular, and swollen to nearly a hundred times its usual size. It is very troublesome in the sugar colonies, penetrating into the skin of the inhabitants, particularly of the negroes, where it lodges its eggs, and causes malignant, and often fatal, ulcers.

'All disputes,' observe Messrs. Kirby and Spence, 'concerning the genus of this insect, would have been settled long before Swartz's time (who first gave a satisfactory description and figure of it, proving it to be a *pulex*, as has been observed above), had success attended the patriotic attempt of the Capuchin friar, recorded by Walton in his History of St. Domingo, who brought away with him from that island a colony of these animals, which he permitted to establish themselves in one of his feet; but unfortunately for himself, and for science, the foot entrusted with the precious deposit mortified, was obliged to be amputated, and with all its inhabitants committed to the waves.' According to Ulloa, and his opinion is confirmed by Jussieu, there are two South American species of this mischievous insect. It is described as generally attacking the feet and legs, getting without being felt, between the skin and the flesh, usually under the nails of the toes, where it nidificates and lays its eggs, and, if timely attention be not paid to it, which, as it occasions no other uneasiness than itching, (the sensation at first I am assured is rather pleasing than otherwise), is sometimes neglected, it multiplies to such a degree, as to be attended by the most fatal consequences, often, as in the above instance, rendering amputation necessary, and sometimes causing death. The female slaves in the West Indies are frequently

xtract these pests, which they do employed non dexterity. Yarico, so celebrated with uncid verse, performed this kind office for in prosigon, who says, in his History of Barbahonest I have seen ten,' chigoes, 'taken out of doeset in a morning, by the most unfortunate mynan Yarico, an Indian woman.'

For the *pulex arborea* of Reaumur see PULEX.

Genus 5. *Termes.*—*Antennæ* generally moniliform; *mouth* having two maxillæ, corneous, with a horny quadrifid *lip*, linear acute fringes, and four equal *palpi*; *eyes* two. Linnæus enumerates three, and Gmelin eight, species.

Some termites have obtained the name of white ants, from their mode of living in large communities, and constructing habitations, like those of the ants. But the termites excel the latter decidedly in their sagacity and acts of government. In its emigrating state we should also notice that this creature certainly *has* wings, and is therefore not with perfect accuracy included in the apterous order. Smeathman, who remarks this, insists that this is the perfect state of the whole of the *T. bellicosa*. Dr. Shaw also says that he has seen winged *T. pulsatoria*. The European species of termes are very small compared with those of warmer regions; and, instead of being gregarious, as in those climates, are usually found single. Of these, the most known is the *T. pulsatorius* of Linnæus, a small insect of a whitish color, distinguished by Derham and the earlier naturalists by the appellation of '*pediculus pulsatorius*.' During the months of summer it is common in houses, particularly in decayed wainscots, and is remarkable for emitting a long-continued sound, resembling the ticking of a watch; it is commonly met with in collections of dried plants, &c., to which it is very injurious. On account of its tender frame, it cannot bear the slightest pressure, and it is very quick in its motion. When magnified, the head appears large, the eyes conspicuous, of a beautiful golden color, and divided into innumerable hexagonal convexities; the antennæ long and setaceous; the palpi two in number, moderately long, and terminating in a large club-shaped top; the thorax rather narrow, and the abdomen obtusely oval; the thighs, or first joints of the legs, thick, the remaining ones slender, and the feet furnished with very small claws. The whole animal is beset with scattered hairs. This insect, according to the observations of Dr. Derham, when first hatched from the egg, is white, oval, and very small, exactly resembling a common mite; furnished with eight legs, and beset with long hairs. After a certain time it casts its skin, and appears in the form already described. De Geer found on each side of the thorax the appearances of rudiments of wings, resembling a pair of oblong scales. Derham thinks that the ticking sound of these animals is analogous to the call of birds to their mates during the breeding season; and this, says Dr. Shaw, as well as the sound produced by the *ptinus fatidicus*, or death-watch, seems to prove in a convincing manner, that insects possess the faculty of hearing.

The community of the *T. bellicosus*, the most remarkable exotic of this genus, consist of one male and one female generally (the common parents of the whole), and of three orders of insects of very different species apparently, but really the same, who constitute the great commonwealth, or rather monarchy, of their nests.

Previous to breeding, it is said, a most surprising change takes place in the body of the queen or breeding animal. The abdomen of this female, in the *T. bellicosus* especially, begins gradually to extend and enlarge to such an enormous size, that an old queen will have it increased so as to be fifteen hundred, or two thousand times the bulk of the rest of her body; and twenty or thirty thousand times the bulk of a laborer. Mr. Smeathman conjectures the animal is upwards of two years old, when the abdomen is increased to three inches in length; and has sometimes found them of nearly twice that size. The abdomen is now of an irregular oblong shape, being contracted by the muscles of every segment, and is become one vast matrix full of eggs, which make long circumvolutions through an innumerable quantity of very minute vessels, that circulate round the inside in a serpentine manner, which would exercise the ingenuity of a skilful anatomist to dissect and develop. This singular matrix is not more remarkable for its amazing extension and size, than for its peristaltic motion, which resembles the undulating of waves, and continues incessantly without any apparent effort of the animal; so that one part or other alternately is rising and sinking in perpetual succession, and the matrix seems never at rest, but is always protruding eggs to the amount of sixty in a minute; or 80,000 and upward in one day of twenty-four hours. These eggs are instantly taken from her body by her attendants (of whom there are always in the royal chamber, and the galleries adjacent, a sufficient number in waiting), and carried to the nurseries, which in a great nest may some of them be four or five feet distant in a straight line, and consequently much farther by their winding galleries. Here, after they are hatched, the young are attended and provided with every thing necessary, until they are able to shift for themselves, and take their share of labor.

The different insects of this species resemble each other in form, in their manner of living, and in their good and bad qualities: but differ as much as birds in the manner of building their habitations or nests, and in the choice of the materials of which they compose them. There are some which build upon the surface of the ground, or part above and part beneath; and one or two kinds, perhaps more, that build on the stems or branches of trees, sometimes aloft, at a vast height.

Of every community, however, there are three orders; first, the working insects, which, for brevity, we shall generally call laborers; next the fighting ones, or soldiers, which do no kind of labor; and, last of all, the winged ones, or perfect insects, which are male and female, and capable of propagating.

The nests of the T. bellicosus are so numerous all over the island of Bananas, and the adjacent continent of Africa, that it is scarcely possible to stand upon any open place, such as a rice plantation, or other clear spot, where one of

these buildings is not to be seen within fifty paces, and frequently two or three are to be seen almost close to each other. In some parts near Senegal, as mentioned by Monsieur Adanson, their number, magnitude, and closeness of situation, make them appear like the villages of the natives. These buildings are usually termed hills, by natives as well as strangers, from their outward appearance, which is that of little hills more or less conical, generally pretty much in the form of sugar-loaves, and about ten or twelve feet in perpendicular height above the common surface of the ground. These hills continue quite bare until they are six or eight feet high; but in time the dead barren clay, of which they are composed, becomes fertilised by the genial power of the elements in these prolific climates, and the addition of vegetable and other matters brought by the wind; and in the second or third year the hillock, if not over-shaded by trees, becomes, like the rest of the earth, almost covered with grass and other plants; and in the dry season, when the herbage is burnt up by the rays of the sun, it is not much unlike a very large hay-cock. Every one of these buildings consists of two distinct parts, the exterior and the interior. The exterior is one large shell in the manner of a dome, large and strong enough to enclose and shelter the interior from the vicissitudes of the weather, and the inhabitants from the attacks of natural or accidental enemies. It is always, therefore, much stronger than the interior building, which is the habitable part, divided with a wonderful kind of regularity and contrivance, into an amazing number of apartments for the residence of the king and queen, and the nursing of their numerous progeny; or for magazines, which are always found well filled with stores and provisions. From these habitations, galleries again ascend, and lead out horizontally on every side, and are carried under ground near to the surface a vast distance; for if you destroy all the nests within 100 yards of your house, the inhabitants of those which are left unmolested farther off, will nevertheless carry on their subterraneous galleries, and invade the goods and merchandises contained in it by sap and mine, and do great mischief if you are not very circumspect.

It has been observed, that there are, in every one of these communities, three orders of insects; of these the working insects or laborers are always the most numerous; in the termes bellicosus there seems to be 100 laborers to one of the fighting insects or soldiers. They are in this state about one-fourth of an inch long, and twenty-five of them weigh about a grain; so that they are not so large as some of our ants. The second order, or soldiers, have a very different form from the laborers, and have been by some authors supposed to be the males, and the former neuters; but they are, in fact, the same insects, only they have undergone a change of form, and approached one degree nearer to the perfect state. They are now much larger, being half an inch long, and equal in bulk to fifteen of the laborers. There is now likewise a most remarkable circumstance in the form of the head and mouth; for in the former state, the mouth is evidently calculated for gnawing and holding bodies; but in this state the jaws being shaped just like two very sharp awls, a little jagged, they are incapable of any hing but piercing or wounding: for which purposes they are very effectual, being as hard as a crab's claw, and placed in a strong horny head, which is of a nut-brown color, and larger than all the rest of the body together, which seems to labor under great difficulty in carrying it; on which account perhaps the animal is incapable of climbing up perpendicular surfaces. The third order, or the insect in its perfect state, varies its form still more than ever. The head, thorax, and abdomen, differ almost entirely from the same parts in the laborers and soldiers; and, besides this, the animal is now furnished with four fine, large, brownish transparent wings, with which it is at the time of emigration to wing its way in search of a new settlement. We may open twenty nests without finding one winged insect, for those are to be found only just before the commencement of the rainy season, when they undergo the last change, which is preparative to their colonisation.

In the winged state they have also much altered their size as well as form. Their bodies now measure between six and seven-tenths of an inch in length, and their wings above two inches and a half from tip to tip, and they are equal in bulk to about thirty laborers, or two soldiers. They are now also furnished with two large eyes, placed on each side of the head, and very conspicuous; if they have any before, they are not easily to be distinguished. Probably in the two first states, their eyes, if they have any, may be small, like those of moles; for as they live, like these animals, always under ground, they have as little occasion for these organs, and it is not to be wondered at that we do not discover them; but the case is much altered when they arrive at the winged state, in which they are to roam, though but for a few hours, through the wide air, and explore new and distant regions. In this form the animal comes abroad during, or soon after the first tornado, which, at the latter end of the dry season, proclaims the approach of the ensuing rains; and seldom waits for a second, or third shower, if the first, as is generally the case, happens in the night, and brings much wet after it. The quantities that are to be found the next morning all over the surface of the earth, but particularly on the waters, are astonishing; for their wings are only calculated to carry them a few hours, and after the rising of the sun not one in 1000 is to be found with four wings, unless the morning continues rainy, when here and there a solitary being is seen winging its way from one place to another, as if solicitous only to avoid its numerous enemies; particularly various species of ants which are hunting on every spray, on every leaf, and in every possible place, for this unhappy race, of which probably not a pair in many millions get into a place of safety, fulfil the first law of nature, and lay the foundation of a new community.

When the T. bellicosi get into a chest or trunk, containing clothes and other things; if

the weight above is great, or they are afraid of ants or other enemies, and have time, they carry their pipes through, and replace a great part with clay, running their galleries in various directions. The tree termites, indeed, when they get within a box, often make a nest there, and being once in possession, destroy it at their leisure. When the termites attack trees and branches in the open air, they sometimes vary the manner of doing it. If a stake in a hedge has not taken root and vegetated, it becomes their business to destroy it. If it has a good sound bark round it, they will enter at the bottom, and eat all but the bark, which will remain and exhibit the appearance of a solid stick (which some vagrant colony of ants or other insects often shelter in, till the winds disperse it); but if they cannot trust the bark, they cover the whole stick with their mortar, and then it looks as if it had been dipped into thick mud that had been dried on. Under this covering they work, leaving no more of the stick and bark than is barely sufficient to support it, and frequently not the smallest particle; so that upon a very small tap with your walking-stick, the whole stake, though apparently as thick as your arm, and five or six feet long, loses its form, and, disappearing like a shadow, falls in small fragments at your feet.

The first object of admiration which strikes one upon opening their hills, is the behaviour of the soldiers. If you make a breach in a slight part of the building, and do it quickly with a strong hoe or pick-axe, in the space of a few seconds a soldier will run out, and walk about the breach, as if to see whether the enemy is gone, or to examine what is the cause of the attack. He will sometimes go in again, as if to give the alarm; but most frequently in a short time, is followed by a large body, who rush out as fast as the breach will permit them; and so they proceed, the number increasing, as long as any one continues battering their building. It is not easy to describe the rage and fury they show. In their hurry they frequently miss their hold, and tumble down the sides of the hill, but recover themselves as quickly as possible; and, being blind, bite every thing they run against, and thus make a crackling noise; while some of them beat repeatedly with their forceps, upon the building, and make a small vibrating noise, something shriller and quicker than the ticking of a watch. If they got hold of any one, they will in an instant let out blood enough to weigh against their whole body; and, if it is the leg they wound, you will see the stain upon the stocking extend an inch in width. They make their hooked jaws meet at the first stroke, and never quit their hold, but suffer themselves to be pulled away leg by leg, and piece after piece, without the least attempt to escape. On the other hand, keep out of their way, and give them no interruption, and they will in less than half an hour retire into the nest, as if they supposed the wonderful monster that damaged their castle to be gone beyond their reach. Before they are all got in, you will see the laborers in motion, and hastening in various directions toward the breach, every one with a burden of mortar in his mouth, ready-tempered. This they stick upon the breach as fast as they come up, and do it with so much despatch and facility, that although there are thousands, or rather millions of them, they never stop or embarrass one another; and you are most agreeably deceived, when, after an apparent scene of hurry and confusion, a regular wall arises, gradually filling up the chasm. While they are thus employed, almost all the soldiers are retired quite out of sight. A renewal of the attack, however, instantly changes the scene. At every stroke we hear a loud hiss; and on the first the laborers run into the many pipes and galleries with which the building is perforated, which they do so quickly that they seem to vanish, for in a few seconds all are gone, and the soldiers rush out as numerous and as vindictive as before.

'The white ant of India is particularly fond of burrowing in the mud walls of the Indian houses. 'My attention' says a late correspondent of the Edinburgh Philosophical Journal, 'was one morning attracted by the appearance of a wet spot on the colored wall of my apartment, at a season, and in a situation, to preclude the supposition of this having been occasioned by rain, or by accident. This led me to examine the spot, and, on slightly touching it, the plaster gave way, and I discovered that a part of the wall behind was hollow. From this I concluded that there was a nest of ants lodged in it; and, on looking narrowly, I heard a sound produced by a rapid succession of strokes, a mimic *alarm-beat*, and immediately a great number of white ants came to the place, with their mouths filled with wet mud, with which they repaired the breach in a few minutes. Their whole proceedings were so curious and interesting, that I frequently amused myself with pulling down what they repaired, and observed that there was always an alarm-beat before they came to build it up.'

## Class II.—Arachnöida.

Linné in his arrangements of all the animals of the phalangium, aranea, creanis, and scorpio genera, under the aptera order has been followed by a no less distinguished modern anatomist than Cuvier.

Duméril, in his Zoologie Analytique, has also placed the *arachnöida* with the apterous insects. He arranges the genus: 1. Ixodes Latr. with Pediculus and Pulex; the other genera he has placed in a peculiar family: 2. Aranea; 3. Mygale; 4. Phrynus; 5. Scorpio; 6. Chelifer; 7. Galeodes; 8. Phalangium.

Lamarck, in his Systême des Animaux sans Vertébres, has included amongst the arachnoides, the myriapoda, and certain animals which Dr. Leach considers as forming a subclass of insects. The same writer in his Extrait du Cours, &c., has placed the *arachnöida* with some genuine insects and *myriapoda;* but he has formed for them a separate order, which he terms *arachnöides palpati*, and disposes them into the following groups of genera:—

I. Pycnogonides.

Genus 1. Nymphum; 2. Phoxichilus; 3 Pycnogonum.

II. Acarides.

* *Parasiticæ*.

a. *Six legs.*

Genus 4. Astoma; 5. Leptus; 6. Caris.

b. *Eight legs.*

Genus 7. Uropoda; 8. Argas; 9. Ixodes; 10. Acarus.

** *Vagebundæ.*

a. *Land.*

Genus 11. Oribata; 12. Smaris; 13. Cheyletus; 14. Bdella; 15. Erythræus; 16. Trombidium.

b. *Aquatic.*

Genus 17. Elais; 18. Limnocharis; 19. Hydrachna.

III. Phalangides.

Genus 20. Siro; 21. Trogulus; 22. Phalangium; 23. Galeodes.

IV. Scorpionides.

Genus 24. Chelifer; 25. Scorpio; 26. Thelephonus; 27. Phrynus.

V. Araneides.

Genus 28. Aranea; 29. Mygale.

The following classification is that lately suggested by Dr. Leach in the third volume of the Zoological Miscellany.

Order I.—Polymerosomata. *Body* composed of a series of segments; *abdomen* not pedunculated; *mouth* furnished with didactyle mandibles and with maxillæ; *eyes* two, four, six, or eight; *legs* eight.

Order II.—Dimerosomata. *Body* composed of two segments; the *abdomen* pedunculated; *mouth* furnished with mandibles and maxillæ; *eyes* six or eight.

The term *Arachnöida* explains the leading feature of this genus; αραχνη, a spider; and ειδος, likeness or resemblance to; the Linnæan genera are,

Genus 1. *Phalangium.*—*Antennæ* none; *mouth* furnished with corneous mandibles, the second joint with a sharp moveable cheliferous tooth; *palpi* filiform; *eyes* two, on the crown, and two at the sides; *legs* eight; the abdomen generally rounded.

Nineteen species have been enumerated; divided into A, having a mouth with a tubular *haustellum*; B, having no haustellum. They are all well armed, and generally malignant in disposition; but very various in point of size, and of degrees of ugliness in their appearance.

The most common species in Europe and America is *P. opilio*, of the family B. It is of a pale blue color; wanders about at night, and preys on smaller insects. It may be observed, during autumn, in gardens, about walls, &c.; it is remarkable for its plump, but at the same time flattish orbicular body, and extremely long and slender legs. The feet are setaceous, and nearly as fine as hair, consisting sometimes of more than forty joints; those toward the extremity being very minute (scarcely discernible), and terminating with a single claw: they are capable of any, even a spiral, inflexion, and, in conjunction with their eight legs, give them an equal hold of eight almost equidistant paces. Their legs are generally so carried that the body appears suspended or elevated to a considerable height above the surface on which the animal rests; the eyes are situated on the top of the head, and resemble two very minute glassy globules. There are other species which have fifty joints in their tarsi.

Those of the family A sometimes have four feelers as the *P. grossipes*, *histrum*, and *spinipes*; others have but two, as the *P. balænarum.*

Genus 2. *Aranea.*—*Antennæ* none; *mouth* having short corneous *maxillæ*; the *lip* rounded at the tip; *palpi* two, incurved, jointed, and very sharp at the end; those of the male clavate; *eyes* eight, rarely six; *legs* eight; *abdomen* ovate, villous, and furnished at the tip with textorial papillæ: 123 species, chiefly inhabitants of Europe and America, have been enumerated. We have treated them at considerable length in the article Aranea.

Respecting the gigantic *A. avicularia*, or bird-catching spider, we may add, however, a remark or two. This enormous spider is not uncommon in many parts of the East Indies and South America; where it resides among trees, frequently seizing on small birds, which it destroys by wounding with its fangs, which inject poison, and afterwards sucking their blood. The slit or orifice near the tip of the fangs in spiders, through which the poisonous fluid is evacuated, and the existence of which has sometimes afforded so much matter of doubt among naturalists, is in this species so visible, that it may be distinctly perceived without the assistance of a glass. This animal appears to admit of some varieties, differing both in size and color; or rather, it is probable that several species, really distinct, have been often confounded in the works of naturalists under one common title. Mr. Jackson found in Morocco (Travels, second edit.) the *A. tendenaman*, with venomous powers equally, or perhaps more formidable. The insect is described to be about the size and color of a hornet, only of a rounder shape: and spins a web so fine as to be nearly invisible. The wound it makes is said to be so poisonous, that a person bitten survives but a few hours. In the cork forests, the sportsman, eager in the pursuit of game, frequently carries away on his garment this fatal insect, which is said always to make towards the head before inflicting its deadly wound.

That spiders have the power of reproducing their legs, and the mode in which this takes place, was first made known by that accurate observer of nature, Sir Joseph Banks. He was writing one evening in his study, when one of the web-spinning spiders, of more than the middle size, passed over some papers on the table, holding a fly in its mouth. Much surprised to see a spider of this description walking about with its prey, and being struck with somewhat unusual in its gait, he caught it, and placed it within a glass for examination, when, instead of eight, he perceived it had but three legs, which accounted for the inability of the creature to spin its web; but the curious circumstance of its having changed its usual economy, and having become a hunting instead of a spinning spider, as well as a wish to learn whether its legs would be renewed, induced him to keep the animal in the glass, from which it could not escape, and to observe its conduct. On the following morning the animal ate two flies given to it, by sucking

out the juices, but left the carcases entire. Two or three days afterwards it devoured the body and head of a fly, leaving only the wings and legs. After this time it sometimes sucked and sometimes ate the fly given to it. At first it consumed two flies in a day, but afterwards not more than one in two days. Its excrement, which it voided, was at first of a milk-white color, but afterwards the white had a black spot in the centre, of a more solid appearance than the surrounding fluid. Soon after its confinement it attempted to form a web on the side of the vessel, but performed the business very slowly and clumsily, from the want of the proper number of legs. In about a fortnight it had completed a small web, upon which it generally sat. A month after having been caught, it shed its skin, leaving the slough on the web. After this change five new legs appeared, not half as long as the other three legs, and of very little use to the animal in walking. These new members, however, extended themselves a little in three days, and became half as long as the old ones. The web was now increased, and the animal continued immoveably sitting on it in the day time, unless drawn from it, or attracted by a fly thrown to it as its usual provision. Twenty-nine days afterwards it again lost its skin, leaving the slough hanging in the web, opposite to a hollow cell it had woven, so as to prevent it from being completely seen when lodged in it. The legs were now larger than before the change of skin, and they grew somewhat longer still in three or four days, but did not attain the size of the old legs. The animal now increased its web, and being put into a small bowl as a more commodious residence, soon renewed a better web than the first. In this state it was left on the first of November. No further observations of it appear to have been recorded.

'The principal use of the *araneadæ*, in the economy of nature,' says Mr. Kirby, 'seems to be that of preventing the too great increase of insects.'

It has lately been discovered, that the web of a species of spider, common in caves in Pennsylvania, possesses a narcotic power; and it has been administered with success in the treatment of certain fevers. This spider, of which M. Hentz has figured a large female, with a description of the parts of the mouth, and the disposition of the eyes, belongs to the genus *tegenaria* of M. Walckenaër, or to that of *aranea*, properly so called, of M. Latreille. M. Hentz proposes to give it the specific name of *T. medicinalis*. It is black, tinged with blue, and its abdomen presents about ten pale and livid spots, as well as a line, towards its anterior extremity. In some individuals the legs are marked with black spots. The author is of opinion that the webs of all the species of the same genus in America are equally narcotic. It would be interesting to make some experiments upon those of the European spiders, with the view of determining whether they possess the same property.—*Journal Acad. Nat. Sciences of Philadelphia*, vol. ii.

Genus 3. *Acarus*.—Mouth with no *proboscis*; *haustellum* included in a bivalve, cylindric sheath; *palpi* two equal, and of the length of the haustellum; *eyes* two, placed at the side of the head; *legs* eight. Gmelin, in the last edition of Linnæus's system, reckons eighty-two species; Fabricius forty: of which, some are inhabitants of the earth, others of water; some live on trees and plants, others among stones; on the bodies of animals and even under their skin. Aristotle (Hist. Anim. l. v. c. 32. Oper. tom. i. p. 857. Ed. Du Val.) mentions the acarus bred in wax, as the least object of human sight.

(1.) Of those injurious to agriculture, Mr. Loudon observes, the *red-spider* is the acarus tellurius L. and the same name is also applied by gardeners to the scarlet acarus (*A. holosericeus*, L.) the only two British species of the genus which infest plants, and to which perhaps they do more injury than all other insects put together. Watering over the leaves is the well known preventive and remedy: the water should be applied to both sides of the leaf in a finely divided state, and with great force, so as to dash the insects to the ground. For this purpose Read's syringe is the most efficient implement at present in use. The sheep-tic (*A. reduvius*,) the dog-tic (*A. ricinus*,) the cheese-mite (*A. siro*), and the itch-mite (*mite de la gale*, Fr.), (*A. exulcerans*, L.), which inhabits the ulcers of the itch, are the principal species mentioned by Linnæus; but some naturalists consider that every animal, and most plants, have their peculiar species of acarus. The harvest-bug is considered by some an acarus, and by others a phalangium.

(2.) Dr. Adams conjectures that acari may be the cause of certain cases of *ophthalmia*. Sir J. Banks, in a letter to that gentleman, relates that some seamen belonging to the Endeavour brig, being tormented with a severe itching round the extremities of the eye-lids, one of them was cured by an Otaheitan woman, who with two small splinters of bamboo extracted from between the *cilia* abundance of very minute lice, which were scarcely visible without a lens, though their motion when laid on the thumb was distinctly perceived. Le Jeune, a French physician quoted in Mouffet, describes a case, in which what seemed a different species, since he calls them rather large, infested the white of the eye, exciting an intolerable itching.

Linné was of opinion that many contagious diseases are caused by acari. With respect to the dysentery and the itch, he affirms that it had been manifested to his eyes. Rolander, a student in entomology, while he resided in the house of the illustrious Swede, was attacked by the disease in question, which quickly gave way to the usual remedies. Eight days after, it returned again, and was as before removed. A third time at the end of the same period, he was seized with it. All the while he had been living the same as the rest of the family, who had nevertheless escaped. This of course occasioned no little enquiry into the cause of what had happened. Linné aware that Bartholinus had attributed the dysentery to *insects*, which he professed to have seen, recommended it to his pupil to examine his fæces. Rolander, following this advice, discovered in them innumerable animalcules, which upon a close examination proved to be acari. It was next a question how he alone

came to be singled out by them; and thus he accounts for it. It was his habit not to drink at his meals; but in the night growing thirsty, he often sipped some liquid out of a vessel made of juniper wood. Inspecting this very narrowly, he observed, in the chinks between the ribs, a white line, which when viewed under a lens he found to consist of innumerable acari, precisely the same as those he had voided. Various experiments were tried with them, and a preparation of rhubarb was found to destroy them most effectually. He afterwards discovered them in vessels containing acids, and often under the bungs of casks. In the instance here recorded, the dysentery, or diarrhœa, was evidently produced by these acari.

After stating some questionable cases in which acari are supposed to have been connected with, if not the cause of *scabies*, Mr. Kirby says, 'I shall now produce two instances where acari were evidently concerned. Dr. Mead, from the *German ephemerides*, relates the miserable case of a French nobleman, from whose eyes, nostrils, mouth, and urinary passage, animalcules of a red color, and excessively minute, broke forth day and night attended by the most horrible and excruciating pains, and at length occasioned his death. The account further says, that they were produced from his corrupted blood. This was probably a fancy originating in their red color: but the whole history, whether we consider the size and color of the animals, or the places from which they issue, is inapplicable to *larvæ* or maggots, and agrees very well with *acari*, some of which, particularly *A. autumnalis*, are of a bright red color. The other case, and a very similar one, is that recorded by Mouffet of lady Penruddock; concerning whom he expressly tells us, that acari swarmed in every part of her body--her head, eyes, nose, lips, gums, the soles of her feet, &c., tormenting her day and night, till, in spite of every remedy, all the flesh of her body being consumed, she was at length relieved by death from this terrible state of suffering. Mouffet attributes her disease to the *acarus scabiei*, but from the symptoms and fatal result it seems to have been a different and much more terrific animal. He supposes, in this instance, the insect to have been generated by drinking goat's milk too copiously. This, if correct, would lead to a conjecture that it might have been the *A. lactis*, L.' These cases, as he says, will demonstrate that acari, as well as pediculi are the causes of diseases in the human frame: he proposes to distinguish generally all acarine diseases by the name *acariasis*.

Genus 4. *Scorpio*.—*Antennæ* none; *legs* eight, besides two chelæ, or hands, seated on the fore-part of the head; *eyes* eight, three of them on each side of the thorax, and two on the back; *palpi* two, projecting cheliform; *lip* bifid, *cauda* long, jointed, and terminated by a sharp crooked sting; on the underside, between the breast and abdomen, are two instruments resembling a comb. All the genera are armed with a slightly pungent sting; none of them, however, are dangerous, except in hot climates; they prey upon worms, spiders, flies, &c.; and even on one another with considerable fury.

There are ten species, all of which are of warmer climates than our own. According to M. Maupertuis, they are all viviparous; the body of the pregnant female exhibiting, when dissected, between forty and fifty young. Each of these is separated from the rest by a thin membrane, while all are united by a common filament. This philosopher, in order to ascertain the strength of their venom, bred a great number together, and let them loose upon dogs and other animals, and he found that sometimes the sting was so poisonous as to cause the whole body of the wounded animal to swell, the consequences of which were frequently violent reaching, convulsions, and death. At other times he found the stings of the same species almost harmless. They cast their skins, like spiders, occasionally.

Leuwenhoek discovered an opening on each side of the sting for the emission, as he supposes, of poison, which he thinks is only discharged when that weapon is buried in the wound it makes. The principal species is,

*S. afer*: African scorpion. The combs have thirteen teeth; the hands are slightly heart-shaped and hairy. It inhabits Persia, India, and some parts of Africa. The body is of a glossy brownish-black; the incisures of the abdomen yellow; the first joint of the tail serrate. None are so remarkable for size and the malignity of their poison as this. It has been seen ten inches long, when measured from the end of the claw to the extremity of the tail. The general color being of a dark brown, it is not easily distinguished from the rotten wood and furniture under or within which it lurks. The tail is the reservoir which contains the poison, which is deposited near the extremity, from which it is ejected through two very small holes, one on each side the tip of the sting. These are so very minute, as to elude the sight of any but a very accurate observer, with the assistance of glasses. This species is very much dreaded in Africa, where the activity of the venom is frequently productive of serious evils. Most families in Morocco, which is much infested with this reptile, keep a bottle of scorpions, infused in olive oil, which is used whenever any person is stung by them; for though, it is said, the scorpion carries an antidote in itself, it is not always to be caught, as it often stings a person while asleep, and disappears before he awakes, or thinks of looking for it; in which case the body of the live scorpion cannot be procured. It is necessary to bind the part, if possible, above the place stung, then to cauterise, and afterwards scarify the puncture, to prevent the venom from pervading the system; this method is sometimes effectual, and sometimes fails, according to the situation of the part wounded, or the nature of the scorpion, some being more poisonous than others; but where the flesh of the reptile can be procured, the cure is said to be far more certain.

## Class III.—Myriapoda.

The insects we class under this modern name were included by Linné in the two genera that follow, namely, *scolopendra* and *julus*. Fabricius, in the Supplement to his Entomologia Systematic,

placed them in a particular class named *mitosata*, comprehending all the species under the generic appellations of Linné. G. Cuvier, in his Tableau Élémentaire, also arranges the myriapoda with insects, in which he was followed by C. Duméril, who has, however, adopted the new genera proposed by Latreille. In his later work he has placed them in a peculiar order of the class ARACHNIDES, which he has denominated MYRIAPODA; and has divided them into two families, namely,

Fam. I. CHILOGNATHA. Genera 1. Glomeris. 2. Julus. 3. Polydesmus. 4. Pollyxenus.

Fam. II. SYNGNATHA. Genera 5. Scutigera. 6. Scolopendra.

Lamarck arranged them with the arachnides, into three genera, 1. SCOLOPENDA; 2. SCUTIGERA; 3. JULUS; and, in his last work, he had adopted a fourth genus, POLLYXENUS.

Dr. Leach says, 'All the myriapoda have their head distinct from the body, furnished with two antennæ. *Mandibles* simple, incisive. All or most of the segments of the body furnished with two or four legs. The nervous system is composed of a series of ganglia, one in each segment of the body: these ganglia are brought into communication with each other by a longitudinal bundle of nerves; or, as it is generally, but improperly, denominated, by a spinal marrow.'

Genus 1. *Scolopendra.*—*Antennæ* setaceous; *palpi* two, filiform and united between the jaws; *lip* toothed and cleft; *body* long, depressed, consisting of numerous transverse segments; *legs* numerous; generally as many on each side as there are segments of the body. Of thirteen known species, three are common to this country. In Latin these animals have obtained the name of centipedes, from the number of their feet or legs; one of the species having literally 100 legs on each side. Some of this genus live beneath the bark of decayed trees, or are found below stones and garden boxes; others inhabit fresh and salt waters; and they are all remarkable for the quickness of their general motions, and of that with which they seize other insects.

It has been asserted that, when some scolopendræ are cut to pieces, the segments, like those of the polypi, are capable of reproducing entire animals, but the fact is not certain. Mr. Maloet relates the history of a man, who for three years had a violent pain at the lower part of the forehead, near the root of the nose, at length he felt an itching, and afterwards something moving within his nostril, which he brought away with his finger; it was a worm of the centiped kind, an inch and a half long, which ran swiftly. It lived five or six days among tobacco. The patient was free of his pain ever after. Mr. Littre mentions a like case, in 1708, of a larger centiped voided at the nose, after it had thrown the woman, in whose frontal sinus it was, into convulsions and almost deprived her of reason. *Hist. Acad. Science*, 1753.

Remarkable species are:—(1.) *S. coleoptra.* Having fourteen long legs on each side; the body scutellate. It is found in many parts of Europe. The antennæ are yellow, and as long as the body; the thighs are prickly, and the shanks rough. (2.) *S. gigantea.* Having seventeen legs on each side; tail with two hooked styles. An American insect. (3.) *S. clypeata.* Having thirty legs on each side; the body brown and rough; the head shielded. This is found in Tranquebar. The body is divided into sixteen narrow segments, which are substriate and rough, with raised dots; the head is covered with a rounded entire shield; the antennæ are short and pale; the legs pale; and the tail is emarginate. (4.) *S. electrica.* Having seventy legs on each side; the body is linear. It inhabits Europe, and our own country, in decayed wood, and shines in the dark. The body is very flat, tawny, with a black line down the back. (5.) *Phosphorea.* Having seventy-six legs on each side. It is an Asiatic insect, and shines like a glow-worm in the dark. The head is ovate, yellowish, with two grooved lines, and another transverse one; the antennæ are subulate and ferruginous, with fourteen articulations; the body is filiform, and about as thick as a goose-quill, purplish, with two parallel lines. It has been known to fall from the air into a vessel sailing on the Indian Ocean, 1000 miles from any land. (6.) *S. occidentalis.* Having 123 legs on each side. It inhabits America. The body is ferruginous; the antennæ have fourteen articulations. (7.) *S. Gabrielis.* Having 148 legs on each side; the body is yellowish. It inhabits Italy, and is four times as large as the S. electrica. The antennæ are short, of fourteen articulations; the tail semi-oval, with an appendage and two short styles.

Genus 2. *Julus.*—Has the *lip* crenated and emarginated; *palpi* two, and filiform; *body* long, semi-cylindrical, and consisting of numerous transverse segments; *legs* numerous. Fabricius, who has supplied many new species, distinguishes it merely by the lip and antennæ; the first of which, he observes, is crenated and emarginate, and the latter moniliform: the structure of the body, legs, &c., constitute a secondary character. Most of them can move backwards or forwards with equal facility.

The species are ascertained chiefly by the number of legs. Such as (1.) *J. ovatus.* Legs each side twenty. Lin. Inhabits the seas of Europe. (2.) *J. complanatus.* Legs each side thirty; body flattish; tail pointed. Fabr. *J. complanatus*, Linn., De Geer, &c. *Scolopendra Iulacea*, Scop. Native of Europe. Linné describes the antennæ of this insect as being clavated, which is the case, though slightly. (3.) *J. depressus.* Legs each side thirty; body flattish; tail rounded and entire. Fabr. An Indian species of very large size, the head of which is brown, and the segments rough, gray, and prominent each side. Lund. (4.) *J. Indus.* Legs each side 115. Lin. Inhabits India. (5.) *J. sabulosus.* Legs each side 120. Linn. *J. glabro*, &c. Ray. Found on the nut in Europe. (6.) *J. maximus.* Legs each side 134. Linn. A large species found in South America. Savi has described a *J. fœtidissimus*, which emits a yellow fœtid fluid from its body, which stains the skin red, so that neither friction nor washing will immediately remove it.

## PART IV.

### HISTORY OF ENTOMOLOGY AS A SCIENCE.

We cannot regard entomology as entitled to rank with the sciences until the arrangements of the immortal Linné had assimilated it with those other natural tribes, upon whose structure and economy his labors have thrown such essential light. As we have noticed the first and last editions of his Systema Naturæ in our introduction, we shall now specify a few entomological works that appeared between them.

In 1736 and 1737 the entire works of Swammerdam were first published under the title of Biblia Naturæ, sive Historia Insectorum Belgiæ, cum versione Latinâ, H. D. Gaubii, et vita auctoris, per A. Boerhaave. Such was the apathy of the public, in regard to works of this description, that no bookseller would venture to print this work at his own risk; and the means of Swammerdam were inadequate to its production. At the death of the writer, M. Thevenot, his friend, became possessed of his papers, and among the rest of the MS. of the Biblia Naturæ. After remaining with him some time, it passed into the hands of Du Verney, an able anatomist, who deposited it for another considerable period in his own cabinet, until the illustrious Boerhaave purchased and gave it to the world.

Linné himself, at this period, wrote several tracts on the subject of entomology; which are printed in the Transactions of the Royal Society of Upsal. One of these appeared in 1739, under the title of Om Renarus Brömskulor i Lapland; and another dated Stockholm, in the same year, Tal om Märkwardighter uti Insecterne. In 1746 we find a paper, jointly the production of Linnæus and De Geer, relative to the lantern-fly of China (fulgora candeleria); and about the same time his Fauna Suecica, an enlarged and improved edition of which was published in 1761. The elegant panorpa coa, a scarce species at that period, forms the subject of a small Linnæan paper in 1747. His dissertations Miracula Insectorum, and Noxà Insectorum, bear the same date, 1752: they were both printed at Upsal, and the latter is particularly valuable, from the object in the contemplation of the writer. Six years after this he produced a dissertation called Pandora Insectorum; the year after, a paper on the coccus; and in 1761 his Fundamenta Entomologiæ, a book, in those days, of considerable value as an elementary work, or introduction to this study. A translation of it by W. Curtis was printed at London in 1772. His last entomological paper is upon the genus pausus, a coleopterous insect distinguished by the magnitude of its antennæ.

In 1738 Lesser, a clergyman of Nordhausen, published a work entitled Insecto-Theologia, oder Vernunft und Schriftmässiger Versuch wie ein mensch durch aufmercksame Betrachtung derer sonst wenig geachteten, Insecten, &c. Frankfort und Leipzig, 8vo. It was translated into French by Lyonet in 1742, and is chiefly remarkable for its grave attempts to rectify the abuse of insects in theology; in which he points out the gross outrage on reason committed by the pagans, in making certain insects the idols of their worship; and remarks how much more absurd it must appear, that the Jews and even Christians should have followed their example. He tells us that the Jews are accused of stating many wonderful things relative to insects; such as that Solomon and his workmen employed a worm to shape the stones of the temple, which insect, named schamir, cut and broke them to pieces in places where applied. They add that it was the figure of a grain of barley, and was kept in a leaden box, because, had it reached any rocks, it would have cleft and destroyed them. Among the legends of Catholic superstition he selects other equally remarkable anecdotes. Baldus, he says, in order to prove the real presence in the eucharist, relates that a number of bees being found on holy ground, paid it homage, and carried a portion of it respectfully to their hive. And that St. Francis, once walking in a garden, saw a grasshopper, which immediately quitted the plant it sat upon, and perched on his hand; he ordered it to sing to the praises of God, and, with a pretty loud voice, it immediately began a very fine psalm!

The folio work of L'Admiral, entitled Naawkeurige Waarneemingen van Gestaltverwisselende gekorwene Diertjes, was published at Amsterdam in 1740. It contains a series of elaborately finished etchings of European insects, comprehending about fifty species of the larger lepidopterous tribes. These are represented in a heavy but ingenious manner, in various attitudes, on branches of the different kinds of plants on which they feed. The work was begun in numbers, and intended to contain 100 plates and 400 pages of letter-press. But this design was never completed. There are few copies with more than twenty-five plates, and about five pages of letter-press. Mr. Donovan had a copy containing thirty-two plates, and twenty pages.

In 1741 was published Schæffer's Icones Insectorum circa Ratisbonam Indigenorum, in 3 vols. 4to., the plates being colored. His classification differs from that of Linné, and approaches to that proposed by Geoffroy. He divided insects into seven orders, which he termed classes: 1. *Coleoptero-macroptera*, those with their elytra crustaceous through their whole length, and extending beyond the abdomen when closed. 2. *C. microptera*, those with crustaceous elytra, shorter than the abdomen. 3. *Half-hymenoptera*, such as have their elytra half crustaceous, or becoming toward their extremities membranaceous. 4. *Hymeno-lepidoptera*, insects with transparent or membranaceous wings, imbricated with scales. 5. *Hymeno-gymnoptera*, those with four naked membranaceous wings. 6. *Diptera*, insects with two wings. 7. *Aptera*, those without wings.

In 1743 Mr. George Edwards, of London, published the first volume of his Natural History of Uncommon Birds, and of some other rare and undescribed animals, 4to. Three other volumes appeared in the course of eight years, in which many insects are figured.

In 1744 was published at Stockholm, by De Geer, a little work in 8vo., entitled Tal om nyttan,

som Insectere ochderas sharshadande, tilskynda oss, pointing out the advantages of cultivating the natural history of insects. It is considered the first work that appeared on this subject.

In 1746 a miscellaneous work appeared at Nuremberg, Der Montalich-herausgegebenen Insecten Belustigung, by Rösel of Nuremberg, a miniature painter of genius. The work is in 4to. Two other volumes appeared in 1749 and 1755. To these a fourth was added by a relation (Kleemannir), after his death in 1761; and after that period three other parts.

About 1749, or perhaps earlier, appeared another English entomological work by Benjamin Wilks, entitled the English Moths and Butterflies, together with the Plants on which they feed and are usually found. The greater portion of this work is copied from the most celebrated foreign writers of the day; but the imposition was not discovered until pointed out by Rösel, in the third volume of his Insecten Belustigung. Wilks also published Twelve new Designs of Butterflies, a work of but little use in point of scientific information, though sometimes quoted.

The first volume of the important work of baron Charles De Geer, entitled Memoires pour servir à l'Histoire des Insectes, was printed at Stockholm in 1752, and was received with great satisfaction by every competent judge: the continuation was expected with impatience; but nine years elapsed before the second volume appeared, and it was altogether twenty-six from its commencement to its termination. It was completed in 1778, a year which also closed the author's life.

The system developed in the last volume of De Geer's Memoirs, and that of Geoffroy published in his Histoire Abrégée des Insectes, 1764, are the connecting links between the arrangement first proposed by Linnæus and the more modern systems: as De Geer's, however, was only given to the world in his last volume, published eleven years after the last edition of the Systema Naturæ, we may here exhibit that of Geoffroy. Its principal merit consists in dividing the coleoptera into primary sections, according to the number of the joints of the tarsi. He comprises all the insect tribes in the six following classes: 1. Coleoptera; 2. Hemiptera; 3. Tetraptera alis farinaceis; 4. Tetraptera alis nudis; 5. Diptera; 6. Aptera. The first class corresponds with the Linnæan coleoptera; the second is more accurately regulated by the form of the proboscis; the third agrees with the lepidoptera, having the wings covered with fine powder; the naked wing-tribe unite the neuroptera and hymenoptera; the diptera and aptera are the same with the Linnæan orders.

And now (1767) we come to the date of the last edition of Linné's system. It is in this, as in almost every other department of natural history, invaluable for its perspicuity and simplicity. Building his orders on the character of a single set of organs, the wings, and the varieties of his genera, on the character of particular parts of the head, especially of the antennæ, it is astonishing how nearly his artificial arrangement approaches a natural one. There are, indeed, as Dr. Leach has justly observed, other characters which ought not to be neglected; and although they may be too minute to be regarded by the superficial observer, yet the man of science, who wishes to study the philosophy of classification, can have no doubt as to the superior accuracy of modern investigation and description which take into consideration every possible character, external as well as internal. 'The simplicity of the general distribution proposed by Linnæus,' continues this able writer, 'the celebrity of his name, and the princely patronage under which he wrote, conspired, with other favorable circumstances, to render the science more universally cultivated, admired, and respected about his time, than it appears to have been at any former period. Much credit is undoubtedly due to this great man for his entomological labors. We must not, however, be so unjust as he was, and neglect to acknowledge the merits of his predecessors, who wrote under less favorable circumstances, but nevertheless excelled in this department of science; and to whom Linnæus stands in a very high degree indebted. In the works of Aristotle and Pliny, in those of Aldrovandus and Swammerdam, as well as in those of our countrymen, Ray, Willoughby, Lister, and various others (whose works we have noticed), we perceive, with some variations, the grand outline on which he has founded his arrangement. It was from these valuable sources that he gained the materials, from which he has selected, with profound judgment, and the greatest success, the valuable matter, carefully and industriously separating the dross. The characters of his orders and genera are to be found in several earlier publications, as are descriptions of many of the species. But he has concentrated these scattered rays of science, with so much skill and industry, that we must admit, that to him the science is indebted for that firm foundation on which it now rests. His style throughout is concise and expressive, but in many instances it is so laconic, that it is impossible even to guess at the animals described.'

We should not omit to notice the lasting benefit conferred on natural history by Linné, in the happy invention of the nomen triviale, the trivial name, in which he expresses the peculiarity of any species by a single term added to its generic appellation. These names are current like money, it has well been observed, and of similar utility to the proper names of men.

The application of trivial names to the butterfly and moth tribes in the Systema Naturæ, will be a striking instance of their utility. To prevent confusion the genus phalæna is distributed into sections, distinguished by the terms of *bombyces, noctuæ, geometræ, tortrices, pyralides, tineæ*, and *alucitæ*. The bombyces and noctuæ, which are so much alike, that the females of the bombyces are with great difficulty distinguished from the noctuæ, are named promiscuously. All the geometræ have their names terminating in *aria* and *ata*, according as their antennæ are setaceous or pectinated:—The tortrices, in *aria;* the pyralides, in *alis;* the tinnæ, in *ella;* and the alucitæ, in *dactyla;* so that it is evident, from the termination, to what section the insect is to be referred.

Butterflies are divided into sections, by the names of *equites*, *heliconii*, *danai*, *nymphales*, and *plebeii*. In the vast multitude of butterflies, the greatest part of which are foreign and extra European, and to whose food and manner of life we are utter strangers, it was impossible to give significant trivial names. Linnæus, therefore, by way of simile, has taken the names of the *equites* from the Trojan history. These consist, as it were, of two troops or bodies: of which one contains the sable, and as it were mourning nobles, having red or bloody spots at the basis of their wings. These receive names from the Trojan nobles; and as *Priam* was king of Troy, the most splendid among these bear his name. The other body, ornamented with a variety of gay colors, are distinguished by the names of the Grecian heroes; and, as in both armies there were kings as well as officers of an inferior rank, those elegant butterflies, whose hinder wings resembled tails, were distinguished by some royal name. Thus, when *Paris* is mentioned (knowing from history that he was a Trojan, and of royal blood) we find him among those of the first section; i. e. those of a sable color, spotted in the breast with red, and having their hinder wings resembling tails. When *Agamemnon* is named, we remember him to be a noble Greek, and find him among those nobles which have variegated and swallow-tailed wings. But when *Nereus* is spoken of, we readily know him to belong to the last section, having wings but no tails. The second class, which contains the *heliconii*, derive their names from the muses, as *Urania*. The names of the sons and daughters of *Danaus* are bestowed on the third section. And as these species are subdivided into two other sections, viz. the white and parti-colored, the system is so arranged, that the white ones preserve the names of the daughters of *Danaus*, and the parti-colored ones those of the sons of *Ægyptus*: so that it is evident from the name itself to what section the butterfly is to be referred. The names of the fourth section, *nymphales*, are taken from various nymphs of antiquity; and those of the fifth, *plebeii*, from different men among the ancients, whose names are worthy of remembrance.

We may now conveniently exhibit the system of De Geer:—

| General Classes. | Orders. | Particular Classes or Genera. |
|---|---|---|
| I. Winged. | Four uncased wings. | 1. Scaled wings. Spiral tongue. (*Lepidoptera.*) |
| | | 2. Membranous naked wings. No teeth or tongue. (*Trichoptera ephemerina.*) |
| | | 3. Membranous equal recticulated wings. Teeth. (Rest of *neuroptera.*) |
| | | 4. Membranous unequal wings. Having teeth and sting, or borer, in the female. (*Hymenoptera.*) |
| | | 5. Membranous wings. Tongue bent under the breast. (*Homoptera.*) |
| | Two cased wings. | 6. Membranous wings. Elytra, half coriaceous and half membranous, crossed. Tongue bent under the breast. (*Hemiptera*; leach.) |
| | | 7. Membranous wings. Elytra coriaceous, or semi-crustaceous, aliform. Having teeth. (*Orthoptera.*) |
| | | 8. Membranous wings. Elytra hard and crustaceous. Having teeth. (*Coleoptera.*) |
| | iii. Two uncased wings. | 9. Membranous wings. Poisers. A tongue. No teeth. (*Diptera.*) |
| | | 10. Membranous wings. The male has neither poisers, teeth, or tongue. The female has a tongue in the breast, but no wings. (*Coccus, L.*) |
| II. Without wings. | iv. Subject to metamorphosis. | 11. Wingless. Tongue. Six legs. (*Aphaniptera.*) |
| | v. Not subject to metamorphosis. | 12. Wingless. Head and trunk distinct. Six legs. (*Hexapod aptera, termes, psocus.*) |
| | | 13. Wingless. Head united to the trunk. Eight or ten legs. (*Octoped aptera, arachnida, crustacea.*) |
| | | 14. Wingless. Head and trunk distinct. Fourteen legs or more. (*Polypod aptera, crustacea.*) |

This system conforming in its basis to that of Linné, by forming its classes and orders on the organs of flight, anticipates the system of Fabricius in discriminating its final groups, by the instrument of manducation. It is probable that the prominence thus given to these instruments, might suggest to Fabricius the idea of making them discriminative of all insects.

Entomological works become now so numerous, that we can only notice the new systems, or considerable improvements: in 1770 appeared, in 8vo. A Catalogue of British Insects, by J. R.

Forster, who accompanied captain Cook round the world. It was simply a list of Latin names of insects, amounting to about 1000 species; the greatest number of the British tribes hitherto enumerated. This was intended as a prodromus to a general work on the Insects of Britain: the following year the author gave the world his Novæ Insectorum Centuriæ, which, with the foregoing, are the only entomological works he ever published. The avowed purpose of the latter work, as the reader is informed in the preface, was to give a description of 100 insects not mentioned in the latest work of Linné. The insects he includes are partly indigenous, some are from China, and others from South America. The greater number of them are coleoptera, and are arranged after the manner of Linné, though the genera anthribus and cistela are taken from Geoffroy.

A work was also published this year, in one volume, containing descriptions in French and English, with an index of Linnæan names, illustrated by colored copper-plates, entitled Illustrations of Natural History, wherein are exhibited Figures of Exotic Insects, &c., by D. Drury. The plates form a miscellaneous assemblage of beautiful exotic insects from an extensive collection possessed by Mr. Drury. Three years after the publication of the first volume, a second came out; and the third which concludes the work in 1782. Besides those figured and described in the three volumes published, Mr. Drury had reserved specimens as materials for a fourth, amongst which were a vast number of curious species from the interior of Africa, and other parts of the world rarely visited by Europeans. Mr. Drury's cabinet contained in the whole about 11,000 species of insects, at that time the largest collection known, which he is said to have obtained by transmitting printed directions in various languages for gathering and preserving them; offering six-pence per insect for all, from the size of a honey-bee upwards. This was sold by public auction, and produced £600. The British specimens were purchased by Mr. Donovan.

Approaching the era of Fabricius, we ought perhaps to notice the labors of one or two most accurate observers of insects to whom entomology is much indebted. Conspicuous among these is Reaumur, the most valuable of whose physiological experiments, perhaps, were those relating to the concoctive powers of the stomach in granivorous and carnivorous birds; but who acquired his greatest fame as an entomologist. Besides a number of curious papers on this subject, in the Memoires of the Academy, he published a very elaborate work, entitled Memoires pour servir à L'Histoire Naturelle des Insectes, in six vols. 4to. 1734—1742. This work was the labor of many years, and the result of innumerable observations made in his garden, in which he kept insects of all kinds that he might examine their generation, changes, and mode of life. His friend Bonnet, who communicated for some time his observations to Reaumur, was also a distinguished physiologist in this department of nature. Lyonet's elaborate engravings in his Traité Anatomiquede la Chenille, printed in Holland in 1762, were also a valuable addition to the stores of this science. His treatise is dedicated solely to the anatomy of the caterpillar, which lives in the willow (phalæna cossus), upon the dissections of which this author enters with such minuteness of investigation, that his descriptions of this object occupy rather more than 600 quarto pages. The plates, eighteen in number, with the exception of the first, which represents the microscope employed in his examinations, are entirely appropriated to the representations of the muscles, tendons, fibres, medullary vessels, spiracles, &c., every part of which throughout the whole animal are exhibited in their natural and magnified appearance. These plates nearly resembling mezzotinto, are finished specimens of the stipple style of engraving then prevalent.

A work illustrated by a similar style of engraving was Sepp's Beschouwing der wondern gods in de minstgeachte schepzelen of Nederlandsche Insecten, begun in the year 1762; it is dedicated entirely to the more uncommon moths and butterflies of Holland; the descriptions are in the Dutch language, and the plates are admired for their delicacy of execution.

In 1775 J. C. Fabricius, a pupil of Linné, first announced the principles of his celebrated arrangement of these tribes, under the title Systema Entomologiæ; a classification, founded on the organs of deglutition and mastication. This system, which has undergone several modifications, has been named the Cibarian and the Maxillary system. Insects of every description were at first comprehended by it in eight classes, to which the several names of elentherata, ulonata, synistata, agonata, unogata, glossata, ryngota, and antliata, were assigned. This work, exhibiting great original genius as well as accurate observation, obtained for its author that high repute and patronage which induced him to devote himself to entomological studies for a number of years, during which, several other works of his appeared on the same subject, among which were his Species Insectorum, Entomologia Systematica, &c.; in all which his new mode of classification was established with progressive improvement. His Supplementum Entomologiæ Systematicæ gives the outline of his system in its latest state. In this work he divides genuine insects into the following Orders, which he named classes.

Class I. Eleutherata.—Maxillæ naked, free, bearing palpi.

Class II. Ulonata.—Maxillæ covered by an obtuse galea, or mouth-piece.

Class III. Synistata.—Maxillæ elbowed at their base, and connected with the labium.

Class IV. Piezata.—Maxillæ corneous, compressed, often elongate.

Class V. Odonata.—Maxillæ corneous, dentated. Palpi two.

Class VI. Mitosata.—Maxillæ corneous; no palpi.

Class VII. Unogata.—Maxillæ corneous, unguiculated.

Class VIII. Polygonata.—Maxillæ many, within the lip.

Class IX. Kleistagnata. Maxillæ many, without the lip.

Class X. Exognata. Maxillæ many, outside the lip covered by the palpi.

Class XI. Glossata. Mouth with a spiral tongue reflexed between the palpi.

Class XII Ryngota. Mouth with a rostrum and articulated sheath.

Class XIII. Antliata. Mouth with an inarticulate haustellum.

The first of the classes of this system contains the order *Coleoptera;* the second, the orders *Orthoptera, Dermaptera,* and *Dictyoptera;* the third, the orders *Thysanura, Trichoptera,* and a part of the *Neuroptera;* the fourth, the order *Hymenoptera;* the fifth, the *Neuroptera;* the sixth, the class *Myriapoda;* the seventh, the class *Arachnoida;* the eighth, ninth, and tenth, the class *Crustacea;* the eleventh, the order *Lepidoptera;* the twelfth, the orders *Hemiptera* and *Omoptera;* the thirteenth, the order *Diptera.*

This able entomologist was also the author of various tracts on entomology in the Latin and German languages; and of two principal introductory works, Genera Insectorum, and Philosophia Entomologica. The most valuable part of his system is its mode of distinguishing the genera, which has been largely adopted by more modern writers; while its general arrangement, though at first popular, has been almost as generally abandoned. It 1777 appeared another new, but short-lived system: that of Scopoli conied in his Introductio ad Historiam Naturalem, in which he divides insects into five tribes, under the strange appellations of, 1. *Swammerdami-Lucifuga,* 2. *Geoffroy-gymnoptera,* 3. *Roeselii-lepidoptera,* 4. *Reaumurii-proboscidea,* 5. *Frischii-coleoptera;* identifying each tribe by the name of that author who has, in his opinion, been most successful in the explanation of it. The *lucifuga* includes the lice; *gymnoptera,* his *halterata, aculeata,* and *caudata: lepidoptera,* the moths and butterflies; the *proboscidea* is divided into terrestrial and aquatic, and the *coleoptera* he divides into those inhabiting water, and those the land.

In the same year appeared, at Leipsic, the early part of the large systematic work of J. A. E. Goeze, called Entomologuche beytrage zu des Ritter Linné zwölften ausgabe des Natur Systems, which was continued in part still 1783.

The elementary work of James Barbut, published in 1751, entitled The Genera Insectorum of Linnæus, exemplified by various Specimens of English Insects, is an illustration of the Linnæan system not uninteresting to the English reader; but the author does not seem to have been aware of the great additional contributions to this science which had been made on the continent, since the publication of Linnæus's last work.

In 1788 this science was considerably indebted to Gmelin for an enlarged edition of the Systema Naturæ, which combined the valuable information furnished by the labors of various naturalists of the first consequence since the time of Linné. In the entomological part, the editor was considerably indebted to the writings of Fabricius; for while he rejects his classification, his orders, and most of his genera, he has copied no small portion of his new species. He has, in many instances, described the same species twice or three times, under different names, according to Dr. Leach: 'but we are surprised,' he adds, 'that his errors are so few, when we consider that he was but a closet compiler.'

Olivier, the next systematic writer of consequence, and one of the ablest of the French entomologists, retains the Linnæan arrangement in his Entomologie, ou Histoire Naturelle des Insectes; from the title of which we infer, that its author proposed to have treated on every class and order, and, in conformity with the first part, to have accompanied the whole with figures. Several fasciculi or numbers were published, amounting, altogether, to about three volumes; the whole of which, however, are confined to the order coleoptera, and even that remains incomplete. So far as it does proceed, the work is valuable. Olivier is also the author of several other entomological writings. In the Journal d'Histoire Naturelle, he has a memoir, Sur l'Utilité de l'etude des Insectes, relativement à l'Agriculture et aux Arts. He is also the proposer of a methodical division of insects, in the Dictionnaire Entomologique. According to this plan, insects are to be divided into four parts, namely, 1. Insects with four wings, 2. Insects with two wings and two wing-cases; 3. Insects with two wings; 4. Insects without wings in either sex. These are subdivided into eight orders, the characters of which are taken from the mouth. In 1791 appeared the first volume of the Transactions of the Linnæan Society of London, and contained the following papers: 1. On the Phalæna Bombyx Lubricepeda of Linnæus, and some other species allied to it; by T. Marsham, Esq. 2. Some Observations on the Natural History of Curculio Lapathi and Silpha grisea of Linnæus; by W. Curtis, Esq. 3. Account of a Singular Conformation in the Wings of some Moths, by Esprit Giorna. 4. Descriptions of two new Species of Phalæna, by L. Bosc; and, under the head of extracts from the minute book, an account of a new Buprestis, communicated by Mr. Dryander. The institution of this society has much promoted the study of this as of every other branch of natural history.

In 1792 was commenced, and continued with great spirit for many years, a monthly publication, entitled The Natural History of British Insects, by Mr. Donovan. The design of this undertaking was to afford scientific and general descriptions, accompanied by appropriate colored figures of every insect discovered in this country; and so far as that desirable object could be accomplished, in all their various states of transformation. Mr. D. in 1809, says 'Without incurring the charge of presumption, the writer believes he may be allowed to observe that the present constitutes the most copious work of its kind that has hitherto, or probably ever may be undertaken, as an elucidation of the entomology of Britain.' We have been indebted to it for much information and pleasure in the investigation of this science. It was continued to the extent of eighteen volumes. In 1798 and 1800 Mr. Donovan also enriched this science with his two valuable works on oriental entomology, entitled The Natural History of the Insects of China and India, the former containing many subjects col-

lected by the embassy under lord Macartney, and the latter, also from the first sources of original information, being more immediately intended to elucidate the entomological productions of the British possessions in India.

The year 1792 also gave birth to O. F. Müller's celebrated work, Entomostraca seu Insecta testacea quæ in aquis Daniæ et Norvegiæ reperit, descripsit et Iconibus illustravit, O. F. Müller. Frankfurti, 4to. In this volume, all the Entromostraca, which Linné had comprehended under the generic title *monosculus* (excepting his cancer *salinus* and *stagnalis*), are arranged as follows:

I. Monoculi. * *Univalves.* Gen. 1. Amynome; 2. Nauplius.
** *Bivalves.* Gen. 3. Cypris; 4. Cythere; 5. Daphnia.
*** *Crustacei.* Gen. 6. Cyclops; 7. Polyphemus.

II. Binoculi. * *Univalves.* Gen. 8. Argulus; 9. Caligus; 10. Limulus.
** *Bivalves.* Gen. 11. Lynceus.

What Mr. Donovan calls 'a valuable systematic paper,' proposing 'a new arrangement of the papilios,' by Mr. William Jones, occurs in the second volume of the Transactions of the Linnæan Society, printed at London in 1794. 'The object of this communication is to point out, that the shape of the wings, which form a principal character with Linnæus, in his distribution of this genus into families, though various at the first view, approach each other so gradually, that it is impossible to draw from them the distinguishing line between each family. The number of species known to Linnæus is estimated at rather more than 274, whereas the writer observes, he had seen above 1000 in various cabinets, and about 400 more represented in various publications; and, from an attentive examination of these, is induced to offer the following amendments to the characters of each family, as defined by Linnæus. The latter author describes the *equites* as having 'the upper wings longer from the posterior angle to the point than to the base; and the antennæ often filiform:' this is corrected by saying, 'the upper wings are longer from the posterior angle to the point than to the base, occasioned by having four nerves instead of three, visible in every other family. The palpi frequently only a brush; under wings, with a connecting nerve in the centre, and without an abdominal groove.'—*Heliconii.* 'Wings narrow, entire, often naked, or deprived of scales; the upper wings long, the inferior short.' Linn. To this character is added, that the upper wings have 'a connecting nerve in the centre, very slightly grooved to admit the abdomen, which is in general long, as are also the antennæ.—*Danai.* 'Wings entire.' Linn. Addition: 'the under with a connecting nerve in the centre, and a deep abdominal groove; palpi projecting.'—*Nymphales.* 'Wings denticulated.' Linn. Addition: 'the under without a connecting nerve in the centre, and with a deep abdominal groove; palpi projected.'—*Plebeii.* 'Small rurales; spots on the wings obscure.' Linn. Addition: 'thorax and abdomen slender; under wings without a connecting nerve; antennæ clubbed:' and these are divided into two sections, those with long, weak, flexible tails; and those without tails, and having the wings entire.—*Plebeii urbicolæ.* 'Spots on the wings for the most part transparent.' Linn. These, Mr. Jones divides into three families, according to the following character:—* Thorax and abdomen short, thick, or broad; under wings without a connecting nerve; antennæ uncinated, or crooked at the extremity. ** With upper wings pointed at the extremity, and long in proportion to their width. *** Upper wings less extended, and together with their under wings more rotund; their margins entire. There still remain some papiliones, which do not rank with any division above-mentioned: these are generally of a large size, without an abdominal groove; have no connecting nerve; their antennæ generally acuminated; and the veins of both upper and under wings extending from their root to the extremity nearly in straight lines. The author of this paper constitutes these as a new family, under the name of romani.'

Mr. Dryander's second volume of Catalogus Bibliothecæ Historico-Naturalis, Josephi Banks, baroneti, &c., comprehending the entomological works of that invaluable library, is here worth notice. It issued from the press in 1796. The arrangement of the insects is very classical and original (a modification of that of Linné), and the descriptions most excellent. In 1796, also, P. A. Latreille, whom Dr. Leach calls 'the first of entomologists,' produced his Precis des Caractéres des Genres, a work which commences a new era in the science of entomology, and, in which, for the first time, the distribution of insects, crustacea, &c., into families, is indicated. The genera are characterised by their organs of mastication.

As we cannot further detail the progress of this science annually, we may here pursue the development of this most important modern system:—

In 1803 this distinguished writer furnished an interesting paper to the first volume of the Annales du Museum d'Histoire Naturelle, commenced this year. It was entitled Observations sur quelques Guepes, et description d'une larve et d'une espèce inédite de Casside. In the third volume of the same work appear two papers by Latreille. 1. Observations sur l'Abeille parietine, &c., et Considerations sur le genre auqu' elle se rapporte. 2. Des Langoustes du Museum National d'Histoire Naturelle.

In 1809 Latreille produced the first volume of his Genera Crustaceorum et Insectorum, Paris, 8vo. Two more volumes appeared during the following year, and a fourth in 1809. This is characterised by Dr. Leach as by far the best systematic work of the kind hitherto published: and the article Insecta, in the Supplement to the Encyclopædia Britannica, is pronounced (article Entomology) to be founded on the outline of Latreille's system; but the plan of the editor seems to have been afterwards changed; it presents no such outline, and was evidently furnished by another writer.

The Annales du Museum, tom. XI, contains Notice Biograph. sur J. C. Fabricius. Par La-

eille. And vol. XII. of the same work, for 309, 1. Nouvelles Observations sur la manière ont plusieurs insectes de l'ordre hyménoptère ourvoient à la subsistance de leur posterité; ar Latreille. This memoir consists of some ery interesting observations on the economy of le genera bembex, philanthus, anthophora, and arnopes. Tom. XIII., Latreille sur le genre nthidium de Fabricius, &c., in which the speies are well described.

In 1810 this writer published Considerations ır l'Ordre Naturelle des Crustacés des Arachides, et des Insectes, 8vo. 'A most excellent ttle manual for the scientific student' (Leach). 'ol. XIX. of the Annales du Museum contains a Iemoire by Latreille, entitled Sur un Insecte ue les Anciens réputoient fort venimeux, et u'ils nommoïent Bupreste, in which he attempts prove the buprestis of the ancients to have een a meloë, or at least of the same natural mily.

Mémoires du Museum, &c., tom. III., 1817, ontains, 1. Introduction à la Géographie généle des Arachnides et des Insectes, ou des Cliats propres à ces animaux, par P. A. Latreille. Considerations Nouvelles et Generales sur les isectes vivant en Société, par le même.

The last important work of this writer on ntomology with which we are acquainted, is the third volume of Le Regne Animal, &c., by Cuvier, in which he was indebted to Latreille for Les Crustacés, Les Arachnides, et Les Insectes. The crustacea are arranged into five orders, viz. 1. *Decapodes*, comprehending our orders brachyura and macroura. 2. *Stomapodes*, including squilla. 3. *Amphipodes*, embracing our first division of the edriophthalma, or those with compressed bodies. 4. *Isopodes*, under which he has placed the onisci of Linné, or our edriophthalma, with depressed bodies. 5. *Branchiopodes*, or the entomostraca of Müller. The arachnoïda he divides into two orders. 1. *Pulmones* (unogata, Fabr.). 2. *Trachéennes*; but the characters have not directed his classification rigorously. The myriapoda he has placed with the insects, of which they form the first order. To the orders given in his Genera Insectorum, he has added rhipiptera (strepsiptera, Kirby), which is placed between the hymenoptera and the diptera.

Mr. Kirby has denominated this the Eclectic System. It is founded on a consideration of the *entire* structure of these interesting tribes, which he divides by classes into natural groups from the order to the genus. Mr. Kirby has given very valuable tables, both of the orders and subordinate groups of this system, from which we can only find space for the following :—

| Class. | Order. | Family. | | Tribe. | |
|---|---|---|---|---|---|
| I. Crustacea. | | | | | |
| II. Arachnida. | Pulmonariæ. | Araneides . . . | Sedentariæ | Territelæ. | |
| | | | | Tubitelæ. | |
| | | | | Inequitelæ. | |
| | | | | Orbitelæ. | |
| | | | | Laterigradæ. | |
| | | | Vagantes. | Citigradæ. | |
| | | | | Saltigradæ. | |
| | | Pedipalpæ. | | | |
| | | Scorpionides. | | | |
| | Tracheariæ. | Pseudoscorpiones. | | | |
| | | Holetra . . . . . . . . . . | | Phalangita. | |
| | | | | Acaridia . . . | Trombidites. |
| | | | | | Riciniæ. |
| | | | | | Hydrachnellæ. |
| | | | | | Microphthiræ. |
| III. Insecta. | . Myriapoda. | Chilognatha. | | | |
| | | Chilopoda. | | | |
| | 2. Thysanura. | Lepismenæ. | | | |
| | | Podurellæ. | | | |
| | 3. Parasita. | Mandibulata. | | | |
| | | Edentula. | | | |
| | 4. Suctoria. | | | | |
| | 5. Coleoptera. | | | | |
| | 6. Orthoptera. | | | | |
| | 7. Hemiptera. | | | | |
| | 8. Neuroptera. | | | | |
| | 9. Hymenoptera. | | | | |
| | 10. Lepidoptera. | | | | |
| | 11. Rhiphiptera. | | | | |
| | 12. Diptera. | | | | |

Lamarck afterwards (Anim. Invertebr. Artiul. Ann. du Mus. 1821) proposed a fourfold arrangement of his classes into 1. Crustacea. 2. Insecta. 3. Crustaceo-Arachnida. 4. Arachnida; inserting the polypods in the crustacea, and the parasita in the arachnida, under the name of pedicularia. He also divides the insecta into mandibulata and haustellata, making separate order of the pupipara.

We feel bound before we close this sketch to notice the labors of Clairville, Duméril, Lamarck, and Cuvier, on the continent of Europe; and those of our own intelligent countrymen, Dr. Leach, Messrs. Kirby and Spence, and M'Leay.

In 1798 Clairville published a most interesting work on the insects of Switzerland, entitled Entomologie Helvetique, in which he has thus distributed them :—

Order I.—PTEROPHORA. With wings.

A. Mandibulata. With jaws.

Sect. 1. *Elythroptera*. Wings crustaceous.
2. *Deratoptera*. Wings coriaceous.
3. *Dictyoptera*. Wings reticulated.
4. *Phleboptera*. Wings veined.

B. Haustellata. With a sucker.

Sect. 5. *Halteriptera*. Wings with a balance.
6. *Lepidoptera*. Wings covered with powder

Sect. 7. *Hemimeroptera.* Wings half obscure, half diaphanous.

ORDER II.—APTERA. Without wings.

A. HAUSTELLATA. With a sucker.

Sect. 8. *Rophoteira.* With a sharp rostrum.

B. MANDIBULATA. With jaws.

Sect. 9. *Pododonera.* Runners.

The first volume treats of the *Curculionidæ*, and illustrated by some very beautiful plates. Vol. II. which appeared in 1806, of the *Carabidæ* and *Dyticidæ*. Both are valuable and almost essential additions to an entomological library.

In 1800 Cuvier, with the assistance of Duméril, gave to the world his Leçons d'Anatomie Comparée, Paris; in which the anatomy of insects is largely treated, and a new arrangement of them proposed. They are divided into those with jaws, such as *grathaptères, neuroptères, hymenoptères, coleoptères*, and *othoptères*; and, secondly, into those that want jaws, *hemiptères, lepidoptères, diptères*, and *aptères*. In 1803 Cuvier contributed a Dissertation critique sur les espéces d'Ecrevisses connues des Anciens, et sur les noms qu'ils leur ont donnés; to the second volume of the Annales du Museum.

We have noticed the appearance of his Comparative Anatomy in 1805: it will mark the relative estimation of insects in this system to observe here, that the whole animal kingdom is divided by this naturalist into four great types:—

1. VERTEBROSA.—Animals which have their brain and the principal part of their nervous system enclosed within vertebræ, and their muscles attached to a bony skeleton.

2. MOLLUSCA.—Those that have no skeleton; whose muscles are attached to their skin, and whose nervous system is irregular in its form and distribution.

3. ANNULATA.—Those that have no skeleton; whose muscles are attached to their skin, which is hard, or to processes proceeding from it; and whose nervous system consists of a series of knots or ganglia, brought into communication by two longitudinal nervous cords.

4. RADIATA or ZOOPHYTES.—Those whose bodies are radiated, and in whom no nervous system has been discovered, and who have but one opening for the reception and rejection of their food.

The Annulata, in which he obtained the invaluable assistance of Latreille, includes the insecta of Linné.

Lamarck's Système des Animaux sans Vertèbres, is dated Paris, in the ninth year of the revolution (1801). This accurate observer of nature proposes to divide insects into three primary classes: namely, 1. Those with mandibles and jaws. 2. Those with mandibles and a kind of trunk. 3. Those without mandibles, but having a trunk or sucker. The first of these classes contains the coleoptera, orthoptera, and neuroptera; the second is confined to the single order hymenoptera; and the third includes the lepidoptera, hemiptera, diptera, and aptera. The coleoptera are subdivided into three families, according to the number of joints in the feet, as those with five joints in all the feet; those with five joints in each of the four anterior feet, and four in those of the posterior pair. Most of Linnæan aptera are removed to a class preced the insecta; the only genus admitted into aptera of Lamarck being the pulex. These certainly valuable suggestions in the philoso of arrangement.

The Rev. W. Kirby first appeared, we belie as a writer on entomology, in the fourth volu of the Linnæan Transactions, to which he c tributed—1. Amophila, a new genus of Hy nopterous Insects, including the Sphex sabul of Linné. 2. History of Tipula Tritici, Ichneumon Tipulæ, &c. His next product was characterised by Dr. Leach as 'the o purely scientific work on entomology, that appeared in Britain since the time of Ray.' was published in 1802, in two vols. octavo, entitled Monographia apum Angliæ; a Disse tion on the Bees of England. The author c mences with an introduction, in which he giv general view of the rise and progress of branch of entomology, with remarks on the v ous works treating of the subject, definition the terms used in describing the genera and cies by different authors; and, after pointing the confusion that had reigned throughout order hymenoptera, proposes a new set of te with comments on terminology in general. characters of the order hymenoptera, with generic characters, &c., are next given, in mixed with remarks on the economy of group. Under the head Addenda we have marks on other hymenopterous genera: and the end of the first volume, a series of out plates, explaining the various parts of the mo &c., peculiar to each subdivision. The sec volume treats of the species, with occasional marks on the peculiar economy of each. descriptions are minute, and extremely accu 'It is a fact worth relating,' says Dr. L., ' Latreille, the first of entomologists, at the s time wrote on the subject, and established si lar divisions with those proposed by Kirby, sidering each, however, as a peculiar ge Kirby formed from the Linnæan genus apis genera, apis and melitta, which answer to treille's two families, apiariæ and andren Latreille's divisions are more numerous more correct than those of Kirby; but arose no doubt from the longer experienc the author, and the greater extent of his col tion.'

But the work by which this gentleman is known is his Popular Introduction to Ento logy, or the Elements of the Natural Histor Insects, in 4 vols, published in conjunction his friend Mr. Spence. Vol. i. appeared 1815; vol. ii. in 1817, and here the labor his coadjutor almost entirely cease; vols. and iii., containing his system and the tory of this science, appeared in 1826, are particularly valuable. We have been debted to them for many interesting facts in paper.

Dr. Leach also first appeared as a writer entomology in the Transactions of the Linn Society: the volume for the year 1814 cont An Essay on the British Species of Meloë, Descriptions of two Exotic Species, by W

Leach. His next work known to us is, The Zoological Miscellany; or Descriptions of New, Rare, or Highly Interesting animals, by William Elford Leach. Illustrated with Colored Figures, by R. P. Nodder. Vol i. It contains descriptions and figures of several new and curious genera and species of insects. A second volume was published in 1815. Dr. Leach has also distinguished himself as a contributor to the Dictionnaire des Sciences Naturelles, &c., par plusiers Professeurs du Jardin du Roi, &c., of our French neighbours: the articles on Insects were written by professor Duméril; those on Crustacea by Dr. Leach, as correspondent of the French Museum. Dr. Leach is likewise the author of the article CRUSTACEA and several valuable papers on natural history in the Edinburgh Encyclopædia of Dr. Brewster, and of the articles ANNULOSA and ENTOMOLOGY in the Supplement to the Encyclopædia Britannica.

On the whole, and to justify our preference of the system of the immortal Swede, 'entomology,' to adopt the language of Mr. Spence, 'is under the greatest obligations to Illiger in Germany, Latreille in France, [Donovan, Kirby, Leach, and Spence, we may add, in England]; who, having had the good sense to reject the useless while they retain the valuable parts of the Fabrician system, are laboring, by the institution of new genera built upon firm and intelligible characters, to extricate the science from the chaos into which that author has unwittingly reduced it. Fabricius's system has now had a fair trial of upwards of thirty years, and it was at one time universally followed on the continent; yet so far is experience from having confirmed the assertion of its author, 'that the Linnæan system is only calculated to introduce confusion into the science,' that the very system professing to dissipate that confusion is even now fast sinking into oblivion, while the Linnæan orders and generic characters, with such improvements as reason and analogy suggest, and as Linné himself would have approved, are reverted to by the most acute and learned entomologists of the age.'

ENTRAI'L, *v. a.* From en and TRAIL, which see. To mingle, diversify, interweave. Obsolete.

> Over him, art striving to compare
> With nature, did an arbor green dispred,
> Framed of wanton ivy, flowering fair,
> Through which the fragrant eglantine did spread,
> His pricking arms *entrailed* with roses red.
> *Faerie Queene.*

> A little wicker basket,
> Made of fine twigs, *entrailed* curiously,
> In which they gathered flowers.
> *Spenser's Prothal.*

ENTRAILS, *n. s. plur.* Fr. *entrailles*; Span. *entranas*, from Gr. ἔντερα, i. e. εντος, within, or Lat. *intra*, within. The intestines, or inward parts.

> A precious ring that lightens all the hole,
> And shews the ragged *entrails* of this pit.
> *Shakspeare.*

> What, hath thy fiery heart so parched thine *entrails*,
> That not a tear can fall? *Id. Henry VI.*

> The earth hath lost
> Most of her ribs, as *entrails*; being now
> Wounded no less for marble than for gold.
> *Ben Jonson.*

The *entrails* are all without bones; save that a bone is sometimes found in the heart of a stag. *Bacon's Natural History.*

> I tear that hardened heart from out her breast,
> Which with her *entrails* makes my hungry hounds a feast. *Dryden.*

> Every capacious galleon's womb was filled
> With what the womb of wealthy kingdoms yield,
> The new world's wounded *entrails* they had tore,
> For wealth wherewith to wound the old one more.
> *Marvell.*

He had brought to light but little of that treasure, that lay so long hid in the dark *entrails* of America. *Locke.*

> The huntsman now, a deep incision made,
> Shakes out with hands impure, and dashes down
> Her reeking *entrails* and yet quivering heart.
> *Somervile.*

ENTRA'NCE, *v.* From en and trance. Fr. *transe*; Lat. *transeo*, to pass over, or from one region to another. To inspire with ecstasy; make insensible to outward objects.

With delight I was *entranced*, and carried so far from myself, as that I am sorry that you ended so soon. *Spenser.*

> Adam, now enforced to close his eyes,
> Sunk down, and all his spirits became *entranced*.
> *Milton.*

> And I so ravished with her heavenly note,
> I stood *entranced*, and had no room for thought;
> But all o'erpowered with ecstasy of bliss,
> Was in a pleasing dream of paradise. *Dryden.*

Wit too copiously poured out, agitates the hearer with emotions rather violent than pleasing; every one shrinks from the force of its oppression; the company sits *entranced* and overpowered; all are astonished, but nobody is pleased. *Johnson.*

> Some to the fascination of a name
> Surrender judgment hoodwinked. Some the style
> Infatuates, and through labyrinths and wilds
> Of error leads them, by a tune *entranced*. *Cowper.*

> To it the live-long night there sings
> A bird unseen—but not remote:
> Invisible his airy wings,
> But soft as harp that Houri strings
> His long-*entrancing* note! *Byron.*

ENTRANCE OF HOUNDS is a phrase used by sportsmen, to express the instruction of them in the art of hunting. This is thus described by Mr. Daniel and others.

The time of entering hounds is when they are about twelve months old; when, being brought up from their walks, they should be kept separate from the pack. They are then to be taught to take the water and swim; they are to be laid abroad in the heat of the day, to inure them to fatigue and exercise; and they must be frequently led through flocks of sheep and warrens, to use them to be under command, and to know that they are to run at nothing but what the huntsman orders. They must be carefully instructed each to know his own name, the voice of the huntsman, and the notes of the horn; and finally, to use their own language in a proper manner. When young

hounds well know and answer to their names, they should be put into couples, and walked out amongst sheep; and if any be particularly snappish, leave the couples loose about their necks in the kennel, till they are more reconciled to them. If any of them should be very troublesome, couple them to old hounds, always avoiding coupling two dogs together, if possible, and taking care that the couples be tight enough to prevent their heads being slipped out of the collar. After being walked out frequently amongst the sheep, they may be uncoupled a few at a time, and such as offer to run after them should be well chastised; the cry of *ware, sheep,* will afterwards stop them, without further application of the whip; but if once suffered to taste the blood, it will be difficult to reclaim them. If young and old hounds are aired together, let the former be in couples; they are always ready for mischief, and idleness may induce even the latter to join in it. It may be as well to air the young hounds in the country where they are designed to hunt, as they thus acquire some knowledge of it, and will more readily find their way home. Young hounds should be entered as soon as you can; in woodlands and grasslands, it will of course be earlier than in corn countries. Sport in fox-hunting cannot be said to begin before October; but in the two preceding months a pack is either made or spoiled. The best time of entering them is about noon, on a fair warm day; for if they be entered in the morning, they will give out when the heat of the day comes on, and betake themselves to shady places to rest and sleep. Accordingly it is said that hounds should be entered in the heat of the day, and about October or November, for hare-hunting, the weather being then temperate, and young hares that have not been hunted being then more easily taken for their encouragement. A necessary caution is also added, never, at the entering of young hounds, to help them to kill the hare with grey-hounds, for this will deter the hounds from putting their noses to the ground, or trying to hunt her themselves. Take the most advanced, that the game may not stand long before them, and let them be well rewarded when all is over. This ought to be repeated at least once a week, for two months successively; by this means they will be so fleshed and seasoned with what game you may enter them at, that they will never afterwards leave off the pursuit. Hounds, after they are two years old, should be hunted three times a week, if they feed well, and may be kept out the greatest part of the day to try their stoutness. The new hounds should always be entered with the best and staunchest hounds that can be had; and there is not to be one barking dog suffered in the field on this occasion.

Whatever the hounds are finally intended for, it has been said that the hare is the best game to enter them at, because, in this chase, they will learn all the turns and doubles that they can possibly meet with in any other kind, and how to come to the holla. They will learn also from this, to have a perfect and nice scent, and hard feet, by being used to high ways, beaten paths, and dry hills. On the other hand, it has been maintained, that young hounds should always be entered at their own game; because it is a strange contradiction to enter them at a hare, and then to cut them to pieces for afterwards hunting the hare. Most dogs like that scent best, which they were first blooded to; and if blood of the fox be of so much service, that of the hare cannot be deemed a matter of indifference. It is, therefore, without doubt most rational to use them to that scent only, which it is intended they should hunt.

Nature will instruct them how to hunt: art is only necessary to prevent their hunting what they ought not to hunt. Should any young hounds be very fond of hare, let some be found sitting, and started before them, they will soon be checked and cease to run after them. If they are to be steadied from deer, they should often see deer, and they will not regard them. After this probation, a cub should be turned out before them, with some old hounds to lead them on, and they will not long give trouble. After young hounds stoop to a scent, are become handy, know a rate, and stop easily, put them, a few only at a time, into the pack after the old ones have been hunted and had blood; let them be taken the first day where they are certain of finding.

Hounds should be low in flesh when hunting commences; because, the ground being generally hard at that season, they are liable, if lusty, to be shaken. If foxes are plentiful, take the young, with some of the steadiest of the old hounds, where there is least riot, and, should you there find a litter of foxes, the young hounds will be so much improved as to need little subsequent instruction. If any cubs be run to ground, and blood be not then wanted, let them be brought home, and they will be serviceable, should blood be necessary at any time for the young hounds. Frequent hallooing is of use with young hounds, as it keeps them forward, prevents their being lost, and from hunting after the others: the more, therefore, a fox is seen and hallooed, the better. Young hounds are thus made eager, and taught to exert themselves.

At their first entering, hounds cannot be encouraged too much: when they are handy, love a scent, and begin to know what is right, it will be soon enough to chastise them for doing wrong; in which latter case, one severe beating will save much trouble. The whipper in should use his voice as well as his whip when he flogs a hound, and take care that the stroke precedes the rating; and he should remember, that the smack of the whip is often as serviceable as the lash to one who has already felt it. The day after young hounds have had blood is a proper time to take them where there is riot, and, if they merit it, to chastise them: it is always best to correct them when they cannot help knowing what they are corrected for. When hounds go out for this purpose, it should be at a late hour; as the worse the scent is, the less inclinable will they be to run it, and the stopping of them will be more easy and immediate.

Upon the day when a fox is proposed to be turned out, young hounds should draw small covers and furze brakes, where are hares or deer; a little rating and flogging, before they are encouraged to vermin, teaches them both what

they should not and what they should do. A hound that hears a voice which has often rated him, and the whip he has often felt, ought to stop: when hounds are rated, and do not answer the rate, they should be coupled up immediately, and made to know the whipper-in. A most essential point in rendering hounds obedient is to make them understand you; and therefore the language should be appropriate and uniform. Young hounds should be hunted in large covers to tire them out, provided the whipper-in can easily get at them; but when there is much riot there are no openings, the purpose will not be answered, unless you have a body of old hounds to carry on the right scent: for the young hounds, as soon as the ground becomes foiled, will be scattered about the cover, hunting old scents, and will not proceed fast enough to tire themselves. Besides, every fox-hound will leave a bad scent of a fox for a good one of either hare or deer, unless he has been made steady from both. Young hounds are all given to riot; but the better they are bred, the less trouble will they be likely to give: high bred fox-hounds love their own game best: they should have little rest; one day they should be hunted in large covers, where foxes are plentiful; the next, they ought to be walked out amongst hares and deer, and stopped from riot; and the day following be hunted again as before. By this management young hounds will soon become steady.

At first young hounds should be entered to vermin only; and they should be used, as early as possible, to the strongest and thickest woods and furzes, and they will seldom be shy of them afterwards. By being awed from hare and deer, and being taught to hunt only vermin, hounds will stop at a word, because that word will be understood by them; and a smack of the whip will spare the inhuman trouble of cutting hounds in pieces for faults, which, if entered at hare, they have been invited to commit. In hare-hunting, the hounds, when first entered, must have all the advantages given them that can be. When the hare is put up from her form, it must be observed which way she went, and the scent must be left to cool a while, and then they must be laid in, and helped as much as can be, by wind, view, hoila, or pricking the passage; nor will it be amiss, for the first time, to give them a hare tired the same morning in her course.

Some are of opinion that the best way to enter young hounds is, to take a live hare, and trail her upon the ground, sometimes one way, and sometimes another, and then to draw her off to a convenient distance, and hide her, that the dogs, taking the scent, may follow all the traces through which she was drawn, and at length find her. It has been said, however, that beating the hare up from her seat is a shorter way than trailing her from her feed to her form.

The huntsman ought well to understand the nature and disposition of his hounds in finding out the game; for some hounds are of that temper, that when they have found the scent, they will run forward with it, not making any noise, nor show of the tail; others, when they have found a head, will show the game; and some, having found the footings of the beast, will prick up their ears a little, and either bark, or only wag their ears, or the hinder part of their bodies. This difference of natural disposition the huntsman is particularly to observe in the young and newly entered pack, otherwise he will never understand them, nor ever be able to hunt them to any credit or advantage.

For entering the hound at hart or buck, he should be in the prime of grease, for then he cannot stand up, or hold the chase so long. The forest pitched upon should have all the relays at equal distances, as nearly as may be; but then the young hounds should always have some old staunch ones to enter them, and they should be led to the farthest and last relay, and the hart or buck should be hunted to them. Being come up, the old hounds should be uncoupled; and when they have found the hart, and well entered the cry, then the young ones are to be uncoupled also; and if any of them are found to lag behind, they must be whipped and beaten forward.

In whatever place the hart is killed, the neck should be immediately flayed, and the hounds rewarded; for it is always best to do this while the flesh is hot. Another very good method of entering hounds at the buck, is to take one in the toils or nets, and to wound one of his legs, so as to disable him from running either very swiftly or very far: then let him loose, and first let a blood-hound trace the creature, then let loose all the young hounds; and when they have run down the animal, reward them with the neck. Some enter their hounds with a toil: but this is a bad way; for the hart being in this case always in sight, and not able to run an end, makes a great number of doubles and turnings: this is very different from the chases they are to meet with afterwards; and when they find a hart run in the common way, straight forward, and out of sight, they will leave the chase, as unlike that by which they were taught. *Daniel's Rural Sports.*

ENTRAP', *v. a.* Old Fr. *entraper*, from en and TRAP, which see. To catch in a snare or trap; to ensnare, involve, beguile.

An injurious person lies in wait to *entrap* thee in thy words. *Eccles.* viii. 11.

Misfortune waits advantage to *entrap*
The man most wary, in her whelming lap.
*Faerie Queene.*

Take heed, mine eyes, how ye do stare
Henceforth too rashly on that guileful net;
In which, if ever eyes *entrapped* are,
Out of her bands ye by no means shall get.
*Spenser.*

The fraud of England, not the force of France,
Hath now *entrapt* the noble-minded Talbot.
*Shakspeare.*

He sought to *entrap* me by intelligence. *Id.*

Nor hounds alone this noxious brood destroy;
The plundered warrener full many a wile
Devises to *entrap* his greedy foe,
Fat with nocturnal spoils. *Somervile.*

ENTREAT', *v. a.* & *n.* } ENTREAT'ANCE, *n. s.* } ENTREAT'Y, } Fr. *traiter*; see TREAT. This word seems to have had originally a meaning synonymous with treat, to behave towards; then it was applied to treating with, as in a treaty; and then in its common meaning, to beg. As a verb active it now signifies to solicit, prevail with; as a verb neuter,

to offer or submit a treaty; to discourse, make petition. Entreatance is petition, solicitation, and is synonymous with entreaty.

The Lord was *entreated* of him, and Rebecca his wife conceived. *Gen.* xxv. 21.

Isaac *entreated* the Lord for his wife. *Id.* xxxv. 21.

Whereas thy servant worketh truly, *entreat* him not evil. *Eccles.* vii. 20.

Alexander was the first that *entreated* peace with them. *Mac.*

The garden of Proserpino this hight,
And in the midst thereof a silver seat,
With a thick arbour goodly overdight,
In which she often used, from open heat,
Herself to shroud, and pleasures to *entreat*.
*Faerie Queene.*

I have a wife, whom, I protest, I love;
I would she were in heaven, so she could
*Entreat* some power to change this currish Jew.
*Shakspeare.*

My lord, I must *entreat* the time alone.
—God shield I should disturb devotion. *Id.*

Must you, sir John, protect my lady here?
*Entreat* her not the worse in that I pray
You use her well. *Id. Henry VI.*

If my weak orator
Can from his mother win the duke of York
Anon expect him here; but if she be
Obdurate to *entreaties*, God forbid
We should infringe the holy privilege
Of sanctuary. *Id. Richard III.*

The Janizaries *entreated* for them, as valiant men. *Knolles.*

The most admirable mystery of nature is the turning of iron, touched with the loadstone, toward the north pole, of which I shall have farther occasion to *entreat*. *Hakewill.*

Heretofore they have been wont to be sued to, and *entreated* for without their own *entreaty*; now their misery makes them importunate. *Bp. Hall's Contemplations.*

These two *entreatance* made they might be heard,
Nor was their just petition long denied. *Fairfax.*

Well I *entreated* her, who well deserved:
I called her often; for she always served:
Use made her person easy to my sight,
And ease insensibly produced delight. *Prior.*

It were a fruitless attempt to appease a power, whom no prayers could *entreat*, no repentance reconcile. *Rogers.*

ENTRECASTEAUX (——d'), a French officer and circumnavigator, of the last century, received the command of two frigates, La Recherche and L'Esperance, with which he sailed in quest of the unfortunate M. de la Perouse in 1791. He left Brest on the 27th of September, and died at sea July 20th, 1793. The expedition proceeded on its voyage without success, as to its grand object, and, after having sailed round the world, returned to France in 1794.

ENTREMETS, *n. s.* Fr. Small plates set between the main dishes.

Chards of beet are plants of white beet transplanted, producing great tops, which, in the midst, have a large white main shoot, which is the true chard used in pottages and *entremets*. *Mortimer.*

ENTRE MINHO DOURO is an important province of Portugal, so called from its situation between the rivers Minho and Douro. It is bounded on the north by Gallicia, a province of Spain; on the east by Trazlos Montes and Spain; on the south by the province of Beira, from whic it is separated by the Douro; and on the west b the Atlantic Ocean; and extends from 40° 50' t 42° N. lat., and from 8° 55' to 7° 55' W. long being seventy miles in length, and fifty-two i breadth. It contains 963 parishes, 1460 churche 1130 convents, six sea-ports, and 800,000 inhab tants. It is altogether the most fertile, and th most populous territory in the kingdom. I numerous and fine valleys are shaded by beautifi trees, and watered by limpid streams. Its air pure and healthy; and it produces corn, win oil, and flax, in great abundance, together wi large flocks of sheep, and plenty of game an fish. The principal towns are Braga, Oport Viana, Amarante, Guimaræns, Ponte de Lir and Pezo de Regna. Its rivers are the Minh Lima, Neiva, Cavado, Ave, and the Douro, Ducro, augmented by the Tamega; all of whi run west into the sea.

ENTREPAS, in the manege, a broken pace going, that is neither walk nor trot, but has som what of an amble. This is a pace or gait of su horses as have no reins or back, and go up their shoulders; or, of such as are spoiled in th limbs.

ENTREVAUX, a town of France, in the d partment of the Lower Alps, and chief place o canton, in the district of Castellane, on the V near the ruins of Glandeves; fifteen miles nor east of Castellare.

ENTROCHUS, in natural history, a genus extraneous fossils, usually about an inch lo and made up of a number of round joints, whi when separate and loose, are called trochit they are composed of the same kind of pla spar as the fossil shells of the echini, which usually of a bluish-gray color, and very bri where newly broken; they are all striated fr the centre to the circumference, and have a cav in the middle. The entrochi are found of sizes, from that of a pin's head to a fing length, and the thickness of one's middle fing and are plainly of marine origin, having of sea-shells adhering to them. They seem to the petrified arms of that singular species of sea star-fish, called stella arborescens.

ENTRUST, *v. a.* EN and TRUST, wh see. To treat with confidence; commit to. S INTRUST.

It proves that my father was not mistaken when supposed me too young to be *entrusted* with the ma nagement of important affairs. *Frankli*

ENTRY, in English law, is the taking poss sion of lands or tenements with a title of ent it is also used for a writ of possession, wher man takes possession personally, or by his att ney. There is said to be a right of entry, an title of entry.

Entry may also be defined, an extrajudi and summary remedy, against certain specie injury by ouster, used by the legal owner, w another person, who hath no right, hath pr ously taken possession of lands or tenements. this case, the party entitled may make a for but peaceable entry thereon, declaring thereby he takes possession; which notorious of ownership is equivalent to a feodal investi by the lord: or he may enter on any part o

n the same county, declaring it to be in the name of the whole. Lit. § 417. But if it lies in different counties, he must make different entries. Also, if there be two disseisors, the party disseised must make his entry on both; or if one disseisor has conveyed the lands with livery to two distinct feoffees, entry must be made on both. Co. Litt. 252. If the claimant be deterred from entering by menaces or bodily fear, he may make claim as near to the estate as he can, with the like forms and solemnities: which claim is in force for only a year and a day. Litt. § 422. But this if repeated once in the space of every year and a day (which is called continual claim), has the same effect with, and in all respects amounts to a legal entry. The remedy by entry takes place in three only of the five species of ouster, viz. abatement, intrusion, and disseisin; for, as in these, the original entry of the wrong doer was unlawful, they may therefore be remedied by the mere entry of him who hath right. But, upon a discontinuance, or deforcement, the owner of the estate cannot enter, but is driven to his action: for herein the original entry being lawful, and thereby an apparent right of possession being gained, the law will not suffer that right to be overthrown by the mere act or entry of the claimant. Yet a man may enter on his tenant by sufferance: for such tenant hath no freehold, but only a bare possession; which may be defeated, like a tenancy at will, by the mere entry of the owner. But if the owner thinks it more expedient to suppose or admit such tenant to have gained a tortious freehold, he is then remediable by writ of entry, ad terminum qui preteriit.

By the statute of limitations, 21 Jac. I. c. 16, it is enacted, that no entry shall be made by any man upon lands, unless within twenty years after his right shall accrue. And by stat. 4 and 5 An. c. 16, no entry shall be of force to satisfy the said statute of limitations, or to avoid a fine levied of lands, unless an action be thereupon commenced within one year after, and prosecuted with effect.

A Writ of Entry is a possessory remedy, which disproves the title of the tenant or possessor, by showing the unlawful means by which he entered, or continues possession. Finch, L. 261. The writ is directed to the sheriff, requiring him to 'command the tenant of the land, that he render [in Latin, præcipe quod reddat] to the demandant the land in question, which he claims to be his right and inheritance; and into which, as he saith, the said tenant had not entry, but by (or after) a disseisin, intrusion, or the like, made to the said demandant, within the time limited by law for such actions; or that upon refusal he do appear in court on such a day, to show wherefore he hath not done it.' This is the original process, the præcipe, upon which all the rest of the suit is grounded; wherein it appears that the tenant is required, either to deliver seisin of the lands, or to show cause why he will not. This cause may be either a denial of the fact of having entered by or under such means as are suggested, or a justification of his entry, by reason of title in himself, or in those under whom he makes claim; whereupon the possession of the land is awarded to him who produces the clearest right to possess it. Writs of entry are of divers kinds, distinguished into four degrees, according to which the writs are varied. The first degree is a writ of entry sur disseisin, that lieth for the disseisee against a disseisor, upon a disseisin done by himself; and this is called a writ of entry in the nature of an assise. Second. A writ of entry sur disseisin in le per, against the heir by descent, who is said to be in the per, as he comes in by his ancestor; and so it is if a disseisor make a feoffment in fee, gift in tail, &c., the feoffee and donee are in the per by the disseisor. Third. A writ of entry sur disseisin in le per et cui, where the feoffee of a disseisor maketh a feoffment over to another; when the disseisee shall have this writ of entry sur disseisin, &c., of the lands in which such other had no right of entry but by the feoffee of the disseisor, to whom the disseisor demised the same, who unjustly, and without judgment, disseised the demandant. 1 Inst. 238.

These three degrees thus state the original wrong, and the title of the tenant who claims under such wrong. If more than two degrees (that is two alienations or descents) were past, there lay no writ of entry at the Common Law. For, as it was provided for the quietness of men's inheritances, that no one, even though he had the true right of possession, should enter upon him who had the apparent right by descent or otherwise, but he was driven to his writ of entry to gain possession; so, after more than two descents, or two conveyances were passed, the demandant, even though he had the right both of possession and property, was not allowed this possessory action; but was driven to his writ of right, a long and final remedy, to punish his neglect in not sooner putting in his claim while the degrees subsisted; and for the ending of suits, and quieting of all controversies. 2 Inst. 153. But by the stat. of Marlbridge, 52 Hen. III. c. 30, it was provided, that when the number of alienations or descents exceeded the usual degrees, a new writ should be allowed, without any mention of degrees at all. And accordingly, fourthly, a new writ has been framed, called a writ of entry in the post, which only alleges the injury of the wrong-doer, without deducing all the intermediate titles from him to the tenant; stating it in this manner, that the tenant had not entry, unless after, or subsequent to, the ouster, or injury done by the original dispossessor; and rightly concluding, that if the original title was wrongful, all claims derived thence must participate of the same wrong. Upon the latter of these writs it is (the writ of entry sur disseisin in the post), that the form of our common recoveries of landed estates is usually grounded.

In order to regain possession of lands by entry, &c., the manner of entry is thus:—If it be in a house, and the door is open, you go into it, and say these words,—I do here enter, and take possession of this house. But if the door be shut, then set your foot on the groundsel, or against the door, and say the before words: and if it be land, then go upon the land, and say, 'I here enter and take possession of this land,' &c. If another do it for you, he must say, 'I do here

enter, &c., to the use of A. B.' And it is necessary to make it before witnesses, and that a memorandum be made of it. Litt. 385. Co. Lit. 237, 238. Where an ejectment will lie, the confession of lease, entry, and ouster is sufficient in all cases, except in the case of a fine with proclamations, in which case it is necessary to prove an actual entry; and the lessor of the plaintiff directing one to deliver a declaration to the tenant in possession, will not amount to such an entry. See EJECTMENT.

As to entries to make execution, &c., where a person is in a house with goods, &c., the house may be entered when the doors are open, to make execution. Cro. Eliz. 759. But it must be averred that the goods were in the house. Lutw. 1428, 1434. And a man cannot enter into a house, the doors being open, to demand a debt, unless he aver that the debtor is within the house at the same time. Cro. El. 6, 8. So entry may be made on a tenant where rent is in arrear, to take a distress, &c. See EXECUTION, RENT, &c.

ENTRY, AD COMMUNEM LEGEM, at Common Law, is the writ of entry which lies where tenant for term of life, or for term of another's life, or by the curtesy, &c., aliens and dies; he in the reversion shall then have this writ against whomsoever is in possession of the land. New. Nat. Br. 461.

ENTRY, AD TERMINUM QUI PRETERIIT, at a term that has ended. A writ of entry anciently brought against tenant for years, who held over his term, and thereby kept out the lessor. But an ejectment is now the common mode of proceeding; and by stat. 4 Geo. II. c 28, tenants for term of years, &c., holding over after demand made, are subject to double rent.

ENTRY, IN CASU CONSIMILI, in like case, is a writ that lies for him in reversion by stat. W. 2. c. 24, against tenant for life, or tenant by the curtesy, who aliens in fee, &c.

ENTRY, IN CASU PROVISO, in the case provided. Where a tenant in dower aliens in fee, or for term of life, or of another's life; then he in the reversion shall have this writ, provided by the stat. of Glouc. 6 Ed. I. c. 7, by which statute it is enacted, 'that if a woman alien her dower in fee, or for life, the next heir, &c., shall recover by writ of entry.'—See title DOWER. And the writ may be brought against the tenant of the freehold of the land, on such alienation, during the life of the tenant in dower, &c.—New. Nat. Br. 456. The above four writs of entry may all be brought either in the per, or in the cui or post.

ENTRY, in Scotch law, refers to the acknowledgment of the title of the heir, &c., to be admitted by the superior.

ENTRY, BILL OF, in commerce. In making entries inwards, it is usual for merchants to include all the goods they have on board the same ship in one bill, though sometimes they may happen to be upwards of twenty several kinds: and, in case the goods are short entered, additional or post entries are now allowed; though formerly the goods so entered were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the customs, you will receive a small piece of parchment called a cocket; which testifies your payment thereof, and all duties for such goods. If several sorts of goods are exported at once, of which some are free, and others pay customs; the exporter must have two cockets, and therefore must make two entries; one for the goods that pay, and the other for the goods that do not pay custom. Entries of goods on which a drawback is allowed, must likewise contain the name of the ship in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the customs for those goods were paid as the law directs, you must carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant warrant, which must be given to the surveyor, searcher, or landwaiter, for them to certify the quantity of goods; after which the certificate must be brought back to the collector and comptroller, or their deputies, and oath made that the said goods are really shipped, and not landed again in any part of Great Britain. See BILL OF ENTRY.

ENTWINE', *v. a.* En and twine. To wreath or twist together. See INTWINE.

> With silvery gossamer *entwined*
> Stream the luxuriant locks behind. *Darwin.*
>
> None knew nor how, nor why, but he *entwined*
> Himself perforce around the hearer's mind;
> There he was stamped, in liking, or in hate,
> If greeted once; however brief the date
> That friendship, pity, or aversion knew,
> Still there within the inmost thought he grew.
> *Byron.*

ENVEL'OPE, *v. a.* & *n. s.* Fr. *envelopper*; Ital. *inviluppo*. The word was formerly spelt envolupe, and seems derived from the Latin *involvo, involui*, to roll up in, through the French and Italian languages. To enwrap, involve, cover, line. Taking the accent on the last syllable, as a substantive, it signifies the outward cover, wrapper, or fold.

> His iron coat, all overgrown with rust,
> Was underneath, *enveloped* with gold,
> Darkened with filthy dust. *Faerie Queene.*
>
> The best and wholesomest spirits of the night *envelop* you, good provost.
> *Shakspeare. Measure for Measure.*
>
> A cloud of smoke *envelops* either host,
> And all at once the combatants are lost:
> Darkling they join adverse, and shock unseen,
> Coursers with coursers justling, men with men.
> *Dryden.*
>
> It is but to approach nearer, and that mist that *enveloped* them will remove. *Locke.*
>
> Nocturnal shades
> This world *envelop*, and the inclement air
> Persuades men to repel benumbing frosts.
> *Philips.*
>
> Send these to paper-sparing Pope,
> And, when he sits to write,
> No letter with an *envelope*
> Could give him more delight. *Swift.*

ENVELOPE, in fortification, a work of earth sometimes in form of a simple parapet, and at others like a small rampart with a parapet: it is raised sometimes on the ditch, and sometimes beyond it.

ENVEN'OM, *v. a.* From en and venom. To taint with poison; deteriorate or disease with

poison or venom: hence to enrage; exasperate; as well as to make odious, or detestable.

The treacherous instrument is in thy hand,
Unbated and *envenomed*. *Shakspeare.*

Oh, what a world is this, when what is comely
*Envenoms* him that bears it! *Id. As You Like It.*

As sin is always dangerous; so most, when we bring it into God's sight: it *envenometh* both our persons and services, and turns our good into evil. *Bp. Hall's Contemplations.*

Alcides, from Oechalia crowned
With conquest, felt the *envenomed* robe, and tore,
Through pain, up by the roots Thessalian pines. *Milton.*

With her full force she threw the pois'nous dart,
And fixed it deep within Amata's heart;
That thus *envenomed* she might kindle rage
And sacrifice to strife her house and husband's age. *Dryden.*

Nor with *envenomed* tongue to blast the fame
Of harmless men. *Philips.*

Of temper as *envenomed* as an asp,
Censorious, and her every word a wasp. *Cowper.*

ENVI'RON, *v. a.* } Fr. *environner*; Old EN'VIRONS, *n. s. pl.* } Fr. *engyronner*, from Lat. *in* and *gyrus*; Gr. εν and γυρος, a circle; within the circle. To enclose; encircle; surround; envelope: environs are neighbouring parts or places; it is a word never used in the singular.

But whanne ye schulen see Jerusalem be *enuy rowned* with an oost: thanne wit ye that the desolacioun of it schal neighe. *Wiclif. Luk* 21.

Now be that here multiplied be 360 sithes; and than thei ben 31500 miles, every of eight furlongs, aftre miles of oure contree. So mochc hathe erthe in roundness, and of heighte *environ*, aftre my opynyoun and myn undirstondynge. *Sir John Mandeville.*

Within the *environing* rocks stood the city. *Sandys.*

Methought a legion of foul fiends
*Environed* me and howled in mine ears. *Shakspeare.*

May never glorious sun reflect his beams
Upon the country where you make abode!
But darkness and the gloomy shade of death
*Environ* you, 'till mischief and despair
Drive you to break your necks. *Id. Henry VI.*

I stand as one upon a rock,
*Environed* with a wilderness of sea. *Shakspeare.*

The country near unto the city of Sultania is on every side *environed* with huge mountains. *Knolles.*

The manifold streams of goodly navigable rivers, as so many chains, *environed* the same site and temple. *Bacon.*

Since she must go, and I must mourn, come night,
*Environ* me with darkness whilst I write. *Donne.*

I did but prompt the age to quit their clogs,
By the known rules of ancient liberty,
When straight a barbarous noise *environs* me. *Milton.*

Thought following thought, and step by step led on,
He entered now the bordering desart wild,
And with dark shades and rocks *environed* round,
His holy meditation thus pursued. *Id.*

God hath scattered several degrees of pleasure and pain in all the things that *environ* and affect us, and blended them together in almost all our thoughts. *Locke.*

The soldier, that man of iron,
Whom ribs of horrour all *environ*. *Cleaveland.*

ENULON, from εν, and ουλον, the gums The internal flesh of the gums, or that part of them which is within the mouth.

ENU'MERATE, *v. a.* } French, *enumerer*; ENUMERA'TION, *n. s.* } Span. and Port. *enumerar*; Lat. *enumero*, from *numerus*, a number. To reckon up distinctly or singly; to number.

Whosoever reads St. Paul's *enumeration* of duties must conclude, that well nigh the business of Christianity is laid on charity. *Sprat.*

You must not only acknowledge to God that you are a sinner, but must particularly *enumerate* the kinds of sin whereof you know yourself guilty. *Wake's Preparation for Death.*

Besides *enumerating* the gross defect of duty to the queen, I shew how all things were managed wrong. *Swift.*

The chemists make spirit, salt, sulphur, water, and earth their five elements, though they are not all agreed in this *enumeration* of elements. *Watts.*

ENUN'CIATE, *v. a.* } Fr. *enoncer*; Lat. ENUNCIA'TION, *n. s.* } *enuncio*, i. e. *e* and ENUN'CIATIVE, *adj.* } *nuncio*, to relate, from ENUN'CIATIVELY, *adv.* } *nuncius*, a messenger. To declare distinctly; proclaim; relate: enunciative is declarative, expressive; and the adverb corresponds.

Preaching is to strangers and infants in Christ to produce faith; but this sacramental *enunciation* is the declaration and confession of it by men in Christ, declaring it to be done, and owned, and accepted, and prevailing. *Taylor.*

It remembers and retains such things as were never at all in the sense; as the conceptions, *enunciations*, and actions of the intellect and will. *Hale's Origin of Mankind.*

This presumption only proceeds in respect of the dispositive words, and not in regard of the *enunciative* terms thereof. *Ayliffe.*

A sentence always implies one complete proposition, or *enunciation* of thought; but every sentence does not confine itself to a single proposition. *Irving's Elements.*

ENUNCIATION is the utterance and combination of the elements, and the consequent pronunciation of syllables, words, &c., as contradistinguished from the tones, and tuning of the voice, and all that belongs to the melody of speech.

The perfection of enunciation consists in, 1. Distinctness, or the clear and perfect formation of the respective elements by right motions and positions of the organs of the mouth, accompanied by proper degrees of energy and impulse to impress those elements fully and contradistinctly on the ear. 2. Articulation, or the act of combining and linking together of the respective elements, so as to form them into intelligible syllables and words, capable of being again combined into clauses and sentences for the proper conveyance of our ideas, thoughts, and determinations. 3. Implication, or the combination and apparent union of words in oral utterance, which are graphically separated; and by which, without injury to the intelligible distinctness of the respective words, all differences of auditory impressions are removed between monosyllabic and polysyllabic composition in language.

Mr. Sheridan, in his lectures, confounds articulation not only with distinctness but with enunciation generally, and even with idiomatic pronunciation, Lect. ii. p. 21. 8vo. edit. But, not to insist upon the important axiom, that the very admission of synonyms is inconsistent with the progress and communication of scientific truth, if such were the use to which the term articulation were to be applied, why did the English grammarian go to the Greek language and to the science of anatomy to borrow a name for an idea which he had already a good and familiar English word fully and completely to convey? Articulation in anatomy signifies the juncture of bones, or that flexible combination of joints or elementary portions into a limb, or of limbs into a body, by which the unity of the whole is constituted, without injury to the individuality of the parts. Or how came he to look out for a supernumerary name to one idea, while another idea equally indispensable to his science (for the combination of elements is as necessary to speech as their formation) without any separate or specific designation?

A good enunciation consists in that clear and accurate delivery of verbal language, by which the requisite qualities of distinctness and articulation are combined and modified; and the due proportions and alterations of sound and interruptions, constituting the specific relations of letters, syllables, members, clauses, and sentences are preserved.

ENUNCIATIVE ORGANS, those portions and members of the human mouth, by the motions, positions, and contact of which specific character is superadded to the original impulses of voice, so as to render them communicable signs of distinct ideas. See ORGANS OF SPEECH.

EN'VOY, *n s.* Fr. *envoye*, from *envoyer*, to send, or Ital. *inviare*, from Lat. *in* and *via*, a way. A public messenger. See below.

Now the Lycian lots conspire
With Phœbus; now Jove's *envoy* through the air
Brings dismal tidings. *Denham.*

Perseus sent *envoys* to Carthage, to kindle their hatred against the Romans. *Arbuthnot on Coins.*

The watchful sentinels at ev'ry gate,
At ev'ry passage to the senses wait;
Still travel to and fro the nervous way,
And their impressions to the brain convey
Where their report the vital *envoys* make,
And with new orders are commanded back.
*Blackmore.*

ENVOYS from the courts of Britain, France, Spain, &c., to any petty prince or state, such as the princes of Germany, the ci-devant republics of Venice, Genoa, &c., go in quality inferior to that of ambassadors; and such a character only do these persons bear, who are sent from any of the principal courts of Europe to another. There are envoys ordinary and extraordinary, as well as ambassadors; they are equally under the protection of the law of nations, and enjoy all the privileges of ambassadors; only differing in this, that the same ceremonies are not observed towards them. The quality of envoy extraordinary according to Wicquefort, is very modern; more modern than that of resident: the ministers invested therewith, at first, took on them most of the state of ambassadors; but they have since been taught otherwise. In the year 1639 the court of France made a declaration, that the ceremonies of conducting envoys extraordinary to their audience in the king and queen's coaches, &c., should be no longer practised. S. Justiniani, the first envoy extraordinary from Venice, after that regulation, offering to cover in speaking to the king of France, it was refused him; and that monarch declared, that he did not expect his envoy extraordinary at the court of Vienna should be regarded any otherwise than as an ordinary resident. Since this time, those two kinds of ministers have been treated alike.

ENURESIS, in medicine an involuntary flow of urine. It is arranged in the class locales and order aponeuroses of Cullen and contains in his method of arrangement two species: 1. E. atonica, the sphincter of the bladder having lost its tone by some previous disease, debility, or neglect. 2. E. ab irritatione vesicæ, from irritation of the bladder, as in the stone, gravel or various venereal complaints. See MEDICINE.

EN'VY, *v. a., v. n.* & *n. s.*
EN'VYING, *n. s.*
EN'VIABLE, *adj.*
EN'VIER, *n. s.*
EN'VIOUS, *adj.*
EN'VIOUSLY, *adv.*
Fr. *envier*; It. *invidiare*; Span. *embidiar*; Lat. *invidere* (*in* and *video*), to look sharply after; hence to watch another man's fortunes. To observe another's happiness or excellence with hatred or grief; to grudge; to feel pain at another's good: or the pain felt in this unhappy way. Hence, also, as a noun, rivalry, malice, in a general sense, ill repute. Envying is synonymous with envy, as a substantive; enviable is liable or exposed to envy.

Moises seith, I schal lede ghou to *envy* that ghe be no folk, that ghe be an unwise folk, I schal sende ghou into wraththe. *Wiclif. Romaynes* 10.

*Envy* thou not the oppressor, and chuse none of his ways. *Prov.* iii. 31.

Be not thou *envious* against evil men.
*Id.* xxiv. 19.

*Envye* forsothe commendeth noughte his reson, that he hath in hain, be it never so trusty. *Chaucer.*

In seeking tales and informations
Against this man, whose honesty the devil
And his disciples only *envy* at,
Ye blew the fire that burns ye.
*Shakspeare. Henry VIII.*

Still in thy right hand carry gentle peace,
To silence *envious* tongues. *Id.*

All the conspirators, save only he,
Did that they did in *envy* of great Cæsar.
*Shakspeare.*

Madam, this is a meer distraction;
You turn the good we offer, into *envy*. *Id.*

I have seen the fight,
When I have *envied* thy behaviour. *Id.*

Men had need beware how they be too perfect in compliments; for that *enviers* will give them that attribute, to the disadvantage of their virtues.
*Bacon.*

Edward Plantagenet should be shewed unto the people; to discharge the king of the *envy* of that opinion and bruit, how he had been put to death privily.
*Id.*

A man that is busy and inquisitive is commonly *envious*; for to know much of other men's matters cannot be, because all that ado may concern his own

estate; therefore it must needs be that he taketh a kind of play-pleasure in looking upon the fortunes of others; neither can he that mindeth but his own business find much matter for *envy*; for *envy* is a gadding passion, and walketh the streets, and doth not keep at home: 'Non est curiosus idem sit malevolus.
*Bacon.*

He that is not industrious *envieth* him that is—and he that standeth at a stay when others rise, can hardly avoid motions of *envy*. *Id.*

They, in an *enviable* mediocrity of fortune, do happily possess themselves.
*Carew's Survey of Cornwall.*

Any superiority is a mark of *envy*. Had Moses and Aaron been but fellows with the Israelites, none had been better beloved. *Bp. Hall's Contemplations.*

Damned spirits, being fallen from heaven, endeavour *enviously* to obstruct the ways that may lead us thither. *Duppa.*

He that loves God is not displeased at accidents which God chuses, nor *envies* at those gifts he bestows.
*Taylor.*

Who would *envy* at the prosperity of the wicked, and the success of persecutors? *Id.*

All preferments in church and state were given by him, all his kindred and friends promoted, and all his enemies and *enviers* discountenanced. *Clarendon.*

If *envy*, like anger, did not burn itself in its own fire, and consume and destroy those persons it possesses, before it can destroy those it wishes worst to, it would set the whole world on fire, and leave the most excellent persons the most miserable. *Id.*

I *envy* no man that knows more than myself, but pity them that know less. *Sir T. Browne.*

They weened
To win the mount of God, and on his throne
To set the *envier* of his state, the proud
Aspirer; but their thoughts proved fond and vain.
*Milton.*

A man of the most *envious* disposition that ever infected the air with his breath, whose eyes could not look right upon any happy man, nor ears bear the burden of any man's praise. *Sidney.*

Johnson, who, by studying Horace, had been acquainted with the rules, seemed to *envy* others that knowledge. *Dryden.*

Sure you mistake the precept, or the tree;
Heaven cannot *envious* of his blessings be. *Id.*

You may see the parliament of women, the little *envier* of them to one another. *Id.*

*Envy* is a repining at the prosperity or good of another, or anger and displeasure at any good of another, which we want, or any advantage another hath above us. *Ray on the Creation.*

*Envy* and cavil are the natural fruits of laziness and ignorance; which was probably the reason, that in the heathen mythology, Momus is said to be the son of Nox, and Somnus of Darkness and Sleep.
*Addison.*

A woman does not *envy* a man for fighting with courage, nor a man a woman for her beauty.
*Collier of Envy.*

*Envy*, to which the ignoble mind 's a slave,
Is emulation in the learned or brave. *Pope.*

You cannot *envy* your neighbour's wisdom, if he gives you good counsel; nor his riches, if he supplies you in your wants; nor his greatness, if he employs it to your protection. *Swift.*

How *enviously* the ladies look,
When they surprise me at my book!
And sure as they be alive at night,
As soon as gone, will shew their spight. *Id.*

High stations tumult, but not bliss create.
None think the great unhappy, but the great.
Fools gaze and *envy*; *envy* darts its sting,
Which makes a swain as wretched as a king.
*Young.*

*Envied*, yet how *unenviable*! what stings
Are theirs! One breast laid open were a school
Which would unteach mankind the lust to shine or rule. *Byron.*

ENWHEE'L, *v. a.* From en and wheel. To encompass; to encircle. A word probably peculiar to Shakspeare.

Hail to thee, lady! and the grace of heaven,
Before, behind thee, and on ev'ry hand
*Enwheel* thee round. *Shakspeare. Othello.*

EN'WOMB, *v. a.* From en and womb. To make pregnant; bury as in the womb.

Me then he left *enwombed* of this child,
This luckless child, whom thus ye see with blood.
*Spenser.*

I'm your mother;
And put you in the catalogue of those
That were *enwombed* mine. *Shakspeare.*

Or as the Afric Niger stream *enwombs*
Itself into the earth, and after comes,
Having first made a natural bridge to pass,
For many leagues, far greater than it was,
May't not be said, that her grave shall restore
Her greater, purer, finer, than before? *Donne.*

ENWRAP, *v. a.* En and wrap; or Lat. *rapio*, to ravish, transport. To involve; envelope; entrance with passion.

His hideous tayle then hurled he about,
And therewith all *enwrapt* the nimble thyes
Of his froth-fomy steed.
*Spenser. Faerie Queene.*

This pearl she gave me I do feel 't and see 't;
And though 'tis wonder that *enwraps* me thus,
Yet 'tis not madness. *Shakspeare.*

The society of wicked men, especially in their sins, is mortally dangerous: while we will not be parted, how can we complain, if we be *enwrapped* in their condemnation? *Bp. Hall.*

For if such holy song
*Enwrap* our fancy long
Time will run back, and fetch the age of gold.
*Milton.*

ENZINAS or DRYANDER (Francis), a protestant writer of the sixteenth century, was born at Burgos, in Spain, about the year 1515. He was educated in Germany, and became a zealous disciple of Melancthon, who thought very highly of his talents, and wrote to archbishop Cranmer in his favor in the year 1548. He published a Spanish translation of the New Testament which he dedicated to the emperor Charles V.; and for which he suffered imprisonment fifteen months. He escaped in the year 1545, and went to Calvin at Geneva. He published A History of the State of the Low Countries, and of the Religion of Spain, which is rare.

ENZINAS (John), brother of the above, resided at Rome for some time, and, becoming a convert to the protestant religion, was setting out for Germany to join his brother, when he was accused of heresy, and thrown into prison. He refused to retract what he had said before the pope and cardinals; but boldly avowed and justified his opinions, for which he was condemned

to be burnt alive, a sentence which was put into execution at Rome in the year 1545.

EOBANUS (Helius), in biography, a modern Latin poet of celebrity, was born in 1488, on the confines of Hesse, and hence obtained the name of Hessus. His parents were so poor, that it has been said he was born in the open air under a wide spreading tree; but his education was not neglected. He was taught Latin at a small school, and pursued his studies at the university of Erfurt, where he afterwards taught the belles lettres till the year 1526, when Melancthon procured him an invitation from the city of Nuremberg. Here he taught for seven years, and then returned to Erfurt, where his reputation was so high, that he is said to have had 1500 scholars. Even this, however, produced such trifling emolument, that he was often laboring under the greatest poverty. He at length obtained through the interest of Philip, landgrave of Hesse, a situation at the university of Marpurg, where he died on the 5th of October 1540. Camerarius wrote his life, and praises his application to labor, and his poetical talents, but he is said to have been a hard drinker.

EO'LIPILE, *n. s.* From *æolus* and *pila*. A hollow ball of metal with a long pipe; which ball, filled with water, and exposed to the fire, sends out, as the water heats, at intervals, blasts of cold wind through the pipe. See ÆOLIPE.

Considering the structure of that globe, the exterior crust, and the waters lying round under it, both exposed to the sun, we may fitly compare it to an *eolipile*, or an hollow sphere with water in it, which the heat of the fire rarifies, and turns into vapours and wind. *Burnet's Theory of the Earth.*

EOOA, EAOOWE, or MIDDLEBURG, the most eastern of the Friendly Islands in the South Pacific Ocean. It is about thirty miles in circuit, and stands high, particularly on the north-east coast side. The north-west part consists of valleys, meadows, and plains. This island abounds with sugar-canes, bananas, and shaddocks, and various vegetables are cultivated in the finest plantations, disposed with much regularity. The quadrupeds are few. The inhabitants are of a light chestnut brown color, and approaching in size nearly to the European. Their features are mild and pleasing; their hair black and strongly curled; and the men clip their beards by means of two sharp mussel shells. Though these islanders are not devoid of shrewdness, they have shown much honesty towards the ships which have visited them. Their arms are clubs, spears, bows of a peculiar construction, and arrows five or six feet long, ingeniously wrought. Matting and cloth of different quality are made here in considerable quantities, which the inhabitants eagerly offer in traffic, and are said to be sufficiently exorbitant in their demands. The women sing simple airs in a minor key; and sometimes in parts: their voices are very soft and agreeable. This island was discovered in 1643, by Tasman, who called it Middleburgh. Long. 171° 30' E., lat. 21° 24' S.

EOOAIGEE, one of the Friendly Islands, four miles east of Tongataboo.

EONIANS, in church history, the followers of Eon, a wild fanatic of the province of Bretagne, in the twelfth century, who conceived that he was the son of God, and ordained to judge the quick and the dead. He was solemnly condemned by the council at Rheims, in 1148, at which pope Eugenius III. presided, and ended his days in a miserable prison. He left a number of followers, whom persecution, so weakly and cruelly employed, could not persuade to abandon his cause, or to renounce his absurdity, which, says Mosheim, one would think could never have gained credit but in Bedlam.

EORAPIE POINT, the northern promontory of the island of Lewis, sometimes called the bull of Lewis, lies in long. 2° 54' W. from Edinburgh; lat. 58° 35' 30" N.

EORIA, in mythology, a feast celebrated by the Athenians in honor of Erigonus, who by way of punishment, for their not avenging the death of his father Icarus, engaged the gods to inflict this curse on their daughters, that they should love men who never returned that passion.

EOROOMANAIA, an islet of the Friendly Islands.

EORSA, one of the smaller Hebrides between Icolmkill and Mull.

EOY, a small island of Scotland, in the Hebrides, between Barry and South Uist.

EOSTRE, in mythology, a goddess of the Saxons, to whom they sacrificed in April, called the month of Eostra; and thence the name of Easter, which the Saxons retained after their conversion to Christianity, applying it to the festival celebrated in commemoration of our Saviour's resurrection.

EPACRIS, in botany, a genus of the monogynia order, pentandria class of plants: CAL. a five-parted perianth: COR. monopetalous and tubular: stamina, five very short filaments: CAPS. roundish, quinquelocular, quinquevalvular, and gaping: SEED numerous and very small. Species four, natives of New Holland, the most beautiful is the E. grandiflora with a shrubby woolly stem, ever-green alternate leaves, and noble crimson flowers, pendulous and scentless.

EPACT, *n. s.* Old Fr. *epacte*; Gr. ἐπακτος. An astronomical number. See below.

As the cycle of the moon serves to shew the *epacts*, and that of the sun the dominical letter, throughout all their variations; so this Dionysian period serves to shew these two cycles both together, and how they proceed or vary all along, 'till at last they accomplish their period, and both together take their beginning again, after every 532d year. *Holder.*

Divide by three; for each one left add ten;
Thirty reject: the prime makes *epact* then.
*Harris*

EPACTS, ANNUAL, are the excesses of the solar year above the lunar. Hence, as the Julian solar year is 365 days 6 h., and the Julian lunar year 354 days 8h. 48' 38", the annual epact will be 10 days 21 h. 11' 22"; or nearly eleven days. Thus this epact of four years is fourteen days, and so of the rest; and thus, the cycle of epacts expires with the golden number, or lunar cycle of nineteen years, and begins with the same:

The following table contains the golden numbers, with their corresponding epacts, till the year 1900.

TABLE OF GREGORIAN EPACTS.

| Golden Numbers. | Epacts. | Golden Numbers. | Epacts. |
|---|---|---|---|
| I | 0 | XI | 20 |
| II | 11 | XII | 1 |
| III | 22 | XIII | 12 |
| IV | 3 | XIV | 23 |
| V | 14 | XV | 4 |
| VI | 25 | XVI | 15 |
| VII | 6 | XVII | 26 |
| VIII | 17 | XVIII | 7 |
| IX | 28 | XIX | 18 |
| X | 9 | I | 0 |

As the new moons fall on the same day every nineteen years, so the difference between the lunar and solar years is the same every nineteen years. And because the said difference is always to be added to the lunar year, to make it equal to the solar year, hence the said difference respectively belonging to each year of the moon's cycle is called the epact of that year. Upon this mutual respect between the cycle of the moon and the cycle of the epacts, is founded this rule for finding the Julian epact, belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into eleven; and if the product be less than thirty, it is the epact sought; and if the product be greater than thirty, divide it by thirty, and the remainder of the dividend is the epact. The difference between Julian and Gregorian years being equal to the excess of the solar above the lunar year, or eleven days, the Gregorian epact of one year is the same with the Julian epact for the preceding year.

EPACTS, MENSTRUAL, are the excesses of the civil or kalendar month above the lunar month. Suppose *e. gr.* it were new moon on the 1st day of January; since the lunar month is 29 days 12 h. 44′ 3″, and January contains 31 days, the menstrual epact is 1 day 11 h. 15′ 57″.

EPAMINONDAS, a celebrated Theban general, the son of Polymnus. He studied philosophy under Lysis, a Pythagorean philosopher; was taught music by Dionysius and Olympiodorus; and was from his infancy inured to all the exercises of body and mind. He saved the life of Pelopidas, who received in battle seven or eight wounds; and contracted a strict friendship with that general which lasted till his death. At his persuasion, Pelopidas delivered Thebes from the yoke of the Spartans, who had rendered themselves masters of Cadmea. Epaminondas, being made general of the Thebans, gained the celebrated battle of Leuctra, in which Cleombrotus II. the valiant king of Sparta, was killed. He then ravaged the enemy's country, and caused the city of Messina to be rebuilt and peopled. At length the command of the army was given to another, because Epaminondas had kept his troops in the field four months longer than he had been ordered by the people; but, instead of retiring in disgust, he now served as a common soldier, and so nobly distinguished himself, that the Thebans, ashamed of having deprived him of the command, restored him to post, in order to carry the war into Thessaly where his arms were always victorious. A war breaking out between the Elians and the inhabitants of Mantinea, the Thebans took the part of the former. Epaminondas then resolved to endeavour to surprise Sparta and Mantinea; but not succeeding he gave the enemy battle, in which he received a mortal wound with a javelin the bearded iron remaining in the wound. Knowing that it could not be drawn out without occasioning immediate death, he would not suffer it to be touched, but continued to give his orders; and on his being told that the enemy were entirely defeated, I have lived long enough, he cried, since I die without being conquered; and at the same time he plucked the javelin from his wound, and expired A. A. C. 363.

EPANELEPSIS, Επαναληψις, or Epanadiplosis, in rhetoric, the repetition of the same word in the beginning of one sentence, and at the end of another. Thus Virgil writes,

Ambo florentes ætatibus, Arcades ambo.

Such, also, is the expression of Plautus (Amph. Act ii. Sc. 2, v. 21): 'Virtue contains all things: he wants no good thing who has virtue.' The figure is the same, though the principle is less honest, which occasions the advice given by the writer in Horace (Epist.i., 1. 65). 'Get money, if you can, honestly; but, however, get money.' This figure adds force to an expression, when the principal thing designed to be conveyed is thus repeated, so as to leave its impression last upon the mind. And the beauty is heightened, when the sentence has an agreeable turn arising from two opposite parts; as in Cicero's compliment to Cæsar (Pro Marcell. c. 6): 'We have seen your victory terminated by the war: your drawn sword in the city we have not seen.'

EPANORTHOSIS, or Correction, in rhetoric, a figure by which the orator revokes and corrects something before alleged, as too weak, and adds something stronger and more conformable to the passion by which he is agitated. The word is formed of ορθος, right, straight; whence ορθοω, I straighten; ανορθοω, επανορθοω, I redress, straighten, correct; and επανορθωσις, correction. Accordingly the Latins call it correctio and emendatio.

This figure is used in different ways. Sometimes one or more words are recalled by the speaker, and others substituted in their room. At other times, without recalling what has been said, something else is introduced as more suitable: instances of both kinds follow. Such, e. gr. is that of Cicero for Cœlius: 'O stultitia! stultitiamne dicam, an impudentiam singularem? Oh folly! folly shall I call it, or rather intolerable impudence?' And in the first Catilinarian: Quanquam quid loquor? Te ut ulla res frangat? Tu ut unquam te corrigas? Tu ut ullam fugam meditere? Tu ullum ut exilium cogites? Utinam tibi istam mentem dii immortales donarent!' Thus, also, Terence, in the Heautontimorumenos, introduces his old man Menedemus, saying: —'Filium unicum adolescentulum Habeo. Ah! quid dixi habere me? imo habui, Chreme. Nunc habeam necne, incertum est.' 'I have an only son, Chremes. Alas! did I say

that I have? I had indeed; but it is now uncertain, whether I have or not.'

EPAULE EN DEDANS, in the manege, a modern French lesson, which, rendered into English, denotes that attitude in which, as the horse goes forward, he is so bent through his whole frame, that if he goes to the right, he must cross the right fore-leg over the left, and so vice versâ; or, in the language of the manege, his inner shoulder, or leg, over the outward. The old masters worked their horses upon circles, when they intended to supple the shoulders and haunches; but to this mode of working upon circles, it has lately been objected that it constrains the fore-part too much, and throws the horse upon his shoulders. To remedy this evil, M. de la Guerriniere, an accomplished horseman at Paris, invented the lesson called epaule en dedans, and established it in his manege. This new method, however, differs very little from the old practice, to which it owes its origin, and from which it is extracted and formed. The only objection against the circle is, that the horse, when worked circularly, has his haunches too much at liberty, by which means the weight of his body is thrown upon his shoulders, which are thereby impeded in their motion; and the animal compelled to work in a manner directly opposite to what he should do. The blame, however, instead of being laid on the circle, should have been ascribed solely to the false and senseless manner in which horses were formerly worked in it; when heavy large bits and cavessons were used, with which the heads of horses were loaded, and brought down to a level with their knees, so that they carried them, like rams, when they fight, and batter one another with their foreheads. Had these old practitioners known the advantage, and, indeed, the necessity, of raising the head, in order to press and bend the haunches, and of doing this by means of a snaffle with double reins, one being tied over the withers, the opposite side to which the horse is to turn, the head would at once have been raised, the outward shoulder brought in, and the horse bent from nose to tail; but this discovery was reserved for Sir Sidney Meadows, who has made many important improvements in the art of horsemanship. *Berenger's History, &c., of Horsemanship*, vol. ii.

EPAU'LET, *n. s.* Fr. *epaulette*. A military shoulder-knot or ornament.

Their vanity was dazzled and seduced by military liveries, cockades and *epaulets*. *Burke.*

EPAULETTES, a kind of military shoulder-knots. Those for the soldiers are of the color of the facing, with a narrow yellow or white tape round it, and worsted fringe; those for the officers are made of gold or silver lace, with a rich fringe; they are badges of distinction worn on one or both shoulders. The following are the gradations of rank as distinguished by epaulettes in the navy. Masters and commanders have one epaulette on the left shoulder. Post captains under three years, one epaulette on the right shoulder: and, after having been post captains three years, two epaulettes. Rear-admirals have one star on the strap of the epaulette, vice-admirals two stars, and admirals three.

EPAULEMENT, in fortification, is a kind of breastwork to cover the troops in front, and sometimes in flank. In a siege, the besiegers generally raise an epaulement of eight or ten feet high, near the entrance of the approaches to cover the cavalry, which is placed there to support the guard of the trenches. These works are sometimes made of filled gabions, or fascines and earth.

EPEE (Charles Michael de l'), was the son of the king's architect, and born at Versailles, France, in 1712. He received an education for the church; and, after finishing his studies, obtained a canonry in the cathedral of Troyes. At the age of twenty-six he is said to have refused a bishopric. His life was principally devoted to the instruction of the dumb; an art which he first derived, it is said, from a Spanish treatise which he accidentally met with. The abbé L'Epee, however, had the merit of bringing this important alleviation of human infirmity into more general use, and making it the object of national institutions. He inherited from his father an income of about £400 a year, of which he expended only a fourth part on himself, employing the remainder for the benefit of his pupils. He died December 23d, 1789, and his plans were followed up by the abbé Sicard. His funeral oration was pronounced by the abbé Fauchet, preacher to the king. He was the author of an Account of the Cure of Marianne Pigalle; and an Elementary Treatise on the Instruction of the Deaf and Dumb.

EPERIES, a town in the lower county of Scharosch, Hungary, on the river Tartza. It is of an oblong shape, with regular fortifications, and a population of 7400, of mixed German, Bohemian, and Hungarian origin. The trade consists in linen, cattle, corn, and wine. The inhabitants are catholics, and a bishopric was established here in 1803. Here is also the seat of a high court of judicature. Fifteen miles north of Caschau.

EPERNAY, a town of Champagne, remarkable for the excellent wine of its neighbourhood, and containing manufactures of woollens, and hardware. It was taken by Henry IV. in 1592, when marshall Biron was killed by a cannon ball. It is agreeably situated on the Marne. Fourteen miles south of Rheims.

EPEUS, a descendant of Endymion, the inventor of the battering ram, an engine of great service in sieges to make a breach. He is said to have built the Trojan horse, and founded the city Metapontum.

*An* EPHA, or EPHAH, אפה as a measure for things dry, was equal to three pecks, three pints, twelve inches and four tenths.

EPHEBÆUM, in antiquity, the place where the ephebi or youth exercised: or, as some say, where those who designed to exercise met, and agreed what kind of exercise they should contend in, and what should be the victor's reward.

EPHEBI, among the ancient Athenians, a designation given to their young men when they arrived at eighteen years of age, at which time they had their names entered in a public register.

EPHEDRA, in botany, a genus of plants of the monadelphia order and diœcia class. MALE

CAL. bifid amentum; COR. none: stamina seven, antheræ four inferior, and three superior: FEM. CAL. bipartite and five fold; pistils two: SEEDS two, covered by the calyx and resembling a berry. Species two, 1. E. dystachya, sea-grape. A native of the south of Europe, with the peduncles opposite. 2. E. monostachya horse-tail. A native of Siberia, with many peduncles and solitary aments.

EPHE'MERA, *n. s.* } Gr. εφήμερη, from
EPHE'MERAL, *adj.* } ημερα, a day. A fever
EPHE'MERIC. } that terminates in a day: an insect that lives only one day: diurnal; beginning and ending in a day.

This was no more than a mere bubble or blast, and like an *ephemeral* fit of applause. *Wotton.*

EPHEMERA, the day-fly, in entomology, a genus belonging to the order of neuroptera. It has no teeth or palpi; there are two large protuberances above the eyes; the wings are erect, the two hind ones being largest; and the tail is bristly. These flies, which take their name from the shortness of their life, are distinguished into several species. Some live several days, others do not take flight till the setting of the sun, and live not to see the rising of that luminary. Some exist but one hour, others but half that time. The ephemeræ, before they flutter in air, have in some respects been fishes. They remain in the states of larva and chrysalis for one, two, or three years. The chrysalis only differs from the larva by having cases for wings on its back. Both have on their sides small fringes of hair, which, when put into motion, serve them as fins. Nothing can be more curious than the plying of those little oars in the water. Their abdomen is terminated, as well as in their state of flies, by three threads. These larvæ scoop out dwellings in the banks of rivers; small tubes made like siphons, the one serving for an entrance, the other affording them an outlet. The banks of some rivers are often perforated with them. When the waters decrease, they dig fresh holes lower down, to enjoy their element the water. The season and hour when the chrysalides of the different species of the ephemeræ turn into flies, maintain a kind of regularity. The heat, the rise or fall of the waters, accelerate, however, or postpone their final display. The ephemeræ of the Rhine appear in the air two hours before sunset. These flies are hatched almost all at the same instant, in such numbers as to darken the air. The most early of those on the Maine and Seine in France, do not begin to fly till two hours after sunset, in the middle of August. They are seen fluttering and sporting on the brink of their tomb. The glare of light attracts them, round which they perform a thousand circles with amazing regularity. Their coming together for the purpose of generation can alone be surmised, the shortness of their life requiring that all their functions should be proportionable to its duration. Some naturalists suppose, that the males impregnate the eggs after the manner of fishes. The females, by the help of the threads of their tails, and the flapping of their wings, support themselves on the surface of the water, and in that almost upright situation drop their eggs in clusters. One single female will lay 700 or 800 eggs, which sink to the bottom. When the flies have propagated, they die and fall by heaps, and the land and water are strewed with them to a considerable thickness.

EPHE'MERIS, *n. s.* } Gr. εφημερις, ημερα,
EPHE'MERIST, *n. s.* } as above. A journal; an account of daily transactions; an account of the daily motions and situations of the planets. An ephemerist is one who consults the planets, or who studies or practises astrology.

When casting up his eyes against the light,
Both month, and day, and hour he measured right;
And told more truly than the *ephemeris*;
For art may err, but nature cannot miss. *Dryden.*

The night before he was discoursing of and slighting the art of foolish astrologers, and genethiacal *ephemerists*, that pry into the horoscope of nativities. *Howel.*

EPHEMERIS, in astronomy, is a table calculated to show the state of the heavens for every day at noon; or the places wherein all the planets are found at that time. From these tables the eclipses, conjunctions, and aspects of the planets, are determined; horoscopes or celestial schemes constructed, &c. In England, the Nautical Almanac, or Astronomical Ephemeris, published annually by anticipation, under the direction of the commissioners of longitude, is the most considerable. In France celestial ephemerides were published by M. Desplaces every ten years, from 1715, to 1745; they were afterwards continued by the abbé Caille, with many additions.

EPHE'MERON-WORM, *n. s.* From ἐφήμερον and worm. A sort of worm that lives but a day.

Swammerdam observes of the *ephemeron-worms*, that their food is clay, and that they make their cells of the same. *Derham.*

EPHESUS, an ancient city of Ionia, greatly celebrated on account of its temple of Diana, and as the most famous mart as well as the metropolis of Asia Minor. The ancient city stood about fifty miles south of Smyrna, near the mouth of the river Cayster, and the shore of the Icarian sea. It was anciently known by the different names of Alopes, Ortygia, Morges, Smyrna, Trachæa, Samornion, and Ptela. It was called Ephesus, according to Heraclides, from Εφησος, permission; because Hercules, says that writer, permitted the Amazons to live and build a city in that place. Others tell us that Ephesus was the name of the Amazon that founded that city; Pliny, Justin, and Orosius, unanimously affirm that it was built by an Amazon; while others bestow this honor upon Androclus, the son of Codrus, king of Athens, who was the chief of the Ionians that settled in Asia.

The Ionians first settled at Ephesus under the conduct of Androclus, who drove out the Carians and Leleges, by whom those places were possessed at his arrival. The city whether built by him, or by one Crœsus or Ephesus, long before the Ionic migration, as others maintain, became soon the metropolis of Ionia. It was at first governed by Androclus and his descendants, who assumed the royal title, and exercised the regal authority over the new colony: whence, even in Strabo's time, the posterity of Androclus were styled kings, and allowed to wear a scarlet robe, with a sceptre, and all the ensigns of royalty. In

process of time, a new form of government was introduced, and a senate established, which continued till the usurpation of Pythagoras, who lived before Cyrus the Great. Having driven out the senate, and taken all the power into his own hands, he filled the city with blood and rapine, not sparing even those that fled to the temple of Diana for shelter. Pythagoras was succeeded by Pindarus, who bore the same sway in the city, but treated the citizens with more humanity. In his time Ephesus being besieged by Crœsus king of Lydia, he advised the inhabitants to devote their city to Diana, and fasten the wall by a rope to the pillars of her temple. They followed his advice, and were, from reverence to the goddess, not only treated with great kindness by Crœsus, but restored to their former liberty, and Pindarus, being obliged to resign his power, retired to Peloponnesus. The other tyrants of Ephesus mentioned in history are Athenagoras, Comas, Aristarchus, and Hegesias: of whom the last was expelled by Alexander, who, coming to Ephesus, after having defeated the Persians on the banks of the Granicus, bestowed upon Diana all the tributes which the Ephesians had paid to the Persians, and established a democracy in the city. Soon after it fell into the hands of Lysimachus, who caused the ancient city to be demolished, built a new one in its place at a vast expense, and in a more convenient situation, and nearer the temple. But so reluctant were the inhabitants to quit their ancient habitations, that the founder of the new city caused all the drains that conveyed the water into the neighbouring fens and the Cayster, to be privately stopped up; so that the city, on the first violent rains that fell, was in great part laid under water; many of the inhabitants were drowned, and those who remained were in this manner constrained to retire into the new city. In the war between Mithridates and the Romans, they sided with the former, and, by his direction, massacred all the Romans that resided in their city; for which barbarity they were severely fined by Sylla; but afterwards treated with lenity, and suffered to live according to their own laws, as is plain from several ancient inscriptions and medals. The Ephesians were much addicted to superstition, sorcery, and curious arts, as the Scripture styles them; whence came the proverb Ephesian letters, signifying all sorts of spells or charms. In the time of the apostle Paul, Ephesus retained a great portion of its ancient grandeur. But in the time of the emperor Justinian, it was so complete a ruin that he filled Constantinople with its statues, and raised his church St. Sophia upon its columns. It has since been almost exhausted.

Towards the end of the eleventh century, a Turkish pirate, named Tangripermes, settled there. But the Greek admiral, John Ducas, defeated him in a bloody battle, and pursued the flying Turks up the Meander. In 1306 it was among the places which suffered from the exactions of the grand duke Roger: and two years after it surrendered to sultan Saysan, who, to prevent future insurrections, removed most of the inhabitants to Tyriæum, where they were massacred. The Ephesians are only a few Greek peasants, living in extreme wretchedness, dependence, and insensibility.

The chief ornament of Ephesus was the temple of Diana, built at the common charge of all the states in Asia, and for its structure, size, and furniture, accounted among the wonders of the world. This edifice was situated at the foot of a mountain, and at the head of a marsh; which place they chose, if we believe Pliny, as the least subject to earthquakes. Here they incurred, however, a vast expense in making drains to convey the water that came down the hill into the morass and the Cayster. Philo Byzantius tells us that in this work they used such a quantity of stone, as almost exhausted all the quarries in the country; and these drains or vaults are what the present inhabitants take for a labyrinth. To secure the foundations of the conduits or sewers, which were to bear a building of such prodigious weight, they laid beds of charcoal, according to Pliny, well rammed, and upon them others of wood. The temple was 425 feet in length, and 200 in breadth, supported by 127 marble pillars seventy feet high, of which twenty-seven were most curiously carved, and the rest polished. These pillars were the works of so many kings, and the bas-reliefs of one were done by Scopas, the most famous sculptor of antiquity; the altar was almost wholly the work of Praxiteles. Cheiromocrates, who built the city of Alexandria, and offered to form mount Athos into a statue of Alexander, was the architect employed on this occasion. The temple enjoyed the privilege of an asylum, which at first extended to a furlong, was afterwards enlarged by Mithridates to a bowshot, and doubled by Marc Antony, so that it took in part of the city: but Tiberius, to put a stop to the many abuses and disorders that attend privileges of this kind, revoked them all, and declared that no man guilty of any wicked or dishonest action should escape justice, though he fled to the altar itself. The priests who officiated in this temple were held in great esteem, and trusted with the care of sacred virgins, or priestesses, but not till they were made eunuchs. They were called Estiatores and Essenæ, had a particular diet, and were not allowed to go into any private house. They were maintained out of the profits accruing from the lake Selinusius, and another that fell into it, which must have been very considerable, since they erected a golden statue to one Artemidorus, who being sent to Rome, recovered them after they had been seized by the farmers of the public revenues. All the Ionians resorted yearly to Ephesus, with their wives and children, where they solemnised the festival of Diana with great pomp and magnificence, making on that occasion rich offerings to the goddess, and valuable presents to her priests. The Asiarchæ mentioned by St. Luke (Acts xix. 31), were, according to Beza, priests who regulated the public sports annually performed at Ephesus in honor of Diana; and were maintained with the collections made during the sports. The great Diana of the Ephesians, as she was styled by her blind adorers, was, according to Pliny, a small statue of ebony, made by one Canitia, though believed by the superstitious to have been sent down from heaven by Jupiter.

This statue was first placed in a niche, which, as we are told, the Amazons caused to be made in the trunk of an elm. Such was the first rise of the veneration that was paid to Diana in this place. In process of time, the veneration for the goddess daily increasing among the inhabitants of Asia, a most stately and magnificent temple was built near the place where the elm stood, and the statue of the goddess placed in it. This was the first temple; but not quite so sumptuous as the second, though reckoned, as well as it, one of the wonders of the world. The second (above described) was remaining in Pliny's time, and in Strabo's; and is supposed to have been destroyed in the reign of Constantine, pursuant to the edict of that emperor commanding all the temples of the heathens to be demolished; the former was burnt the same day that Alexander was born, by one Erostratus, who owned on the rack, that the only thing which had prompted him to destroy so excellent a work, was the desire of transmitting his name to future ages. Alexander offered to rebuild the temple at his own expense, provided the Ephesians would agree to put his name on the front; but they received his offer in such a manner as prevented the resentment of that vain prince, telling him, that 'it was not fit one god should build a temple to another.' The pillars and other materials that had been saved out of the flames, were sold, with the jewels of the Ephesian women, who on that occasion willingly parted with them; and the sum raised from thence served for the carrying on of the work till other contributions came in, which, in a short time, amounted to an immense treasure. Of this wonderful structure there is nothing at present remaining but some ruins, and a few broken pillars, forty feet long and seven in diameter. There are two vast gateways of a theatre, and some walls of brick, faced with marble slabs, supposed either to have formed a part of the temple of Diana, or of the church of St. John; and a large portal, formerly leading to the citadel, wholly built with Roman tiles, faced with polished marble. Over the gateway, above a very rich frieze, are three pieces of exquisite sculpture, one of them representing the bringing of the body of Patroclus to Achilles.

EPHETÆ, from εφιημι, I send forth, in antiquity, magistrates among the Athenians, instituted by king Demophoon, to take cognisance of murder and manslaughter, and chance-medley: their original number was 100, of whom fifty were Athenians, and fifty Argians; but Draco new-modelled the court, excluded the Argians from it, and made it to consist of fifty-one Athenians.

EPHOD, *n. s.* אפד. A sort of ornament worn by the Hebrew priests. See below.

He made the *ephod* of gold, blue, and purple, and scarlet, and fine twined linen. *Exodus* xxxix. 2.

Arrayed in *ephods*; nor so few
As are those pearls of morning dew,
Which hang on herbs and flowers. *Sandys.*

It is an unusual sight for Israel to see a linen *ephod* upon the bier. *Bp. Hall's Contemplations.*

EPHOD, Hebrew אפוד, was evidently the principal article of those figurative garments of salvation, for the forming of which, to array the high priest, Moses was very particularly instructed by God. Compassed about with the ephod, the high priest not only bore the names of the twelve tribes of Israel upon his shoulders, as above noticed, but also in the breast-plate upon his heart, with Urim and Thummim in the midst of them. Many passages of the Old Testament history demonstate the importance of the ephod. See particularly 1 Sam. xxiii. 8—12; xxviii. 6; xxx. 7. In two of these passages David appears enquiring at the ephod as in the presence of God, and receives direct answers from God. From these passages some affirm that the Jewish kings had a right to wear the ephod, and to consult the Lord by Urim and Thummim; but the generality of commentators are of opinion that neither David, Saul, nor Joshua, nor any prince of Israel, dressed themselves in the high priest's ephod, in order to consult God of themselves; but that when David says 'bring me hither the ephod,' he must be understood as saying, 'put on the ephod.' Grotius believes that the high priest turned the ephod or breast-plate towards David's face.

EPHORI, in Grecian antiquity, magistrates established in ancient Sparta to balance the regal power. The authority of the ephori was very great. They sometimes expelled and even put to death the kings, and abolished or suspended the power of the other magistrates, calling them to an account at pleasure. There were five of them, or as others say nine. They presided in the public shows and festivals. They were entrusted with the public treasure, decided on war and peace; and were so absolute, that Aristotle makes their government equal to monarchy. They were established by Lycurgus, according to the generality of authors: though this is denied by others, who date their origin 130 years after the time of that legislator. Thus Plutarch, in his Life of Cleomenes, ascribes their institution to Theopompus king of Sparta, which is also confirmed by the authority of Aristotle.

EPHORUS, an orator and historian of Cumæ in Æolia, about A. A. C. 352. He was disciple to Isocrates, by whose advice he wrote a history of all the battles between the Greeks and barbarians, for 750 years. It was greatly esteemed by the ancients; but is now lost.

EPHRAIM, אפרים, Heb. i.e. fruitful, the second son of the patriarch Joseph, was born in Egypt about A. M. 2293, and was adopted along with his elder brother Manasseh, by their grandfather Jacob, among the progenitors of the tribes of Israel; when a remarkable preference was given to Ephraim.

EPHRAIM, in ancient geography, one of the divisions of Palestine by tribes. Ephraim and the half tribe of Manasseh are blended together by the sacred writer; and it only appears that Ephraim occupied the more southern, and the half tribe of Manasseh the more northern parts, but both seem to have extended from the Jordan to the sea.

EPHRAIM, or the EPHRAIMITES, the descendants of Ephraim, and the principal tribe of the ten, which separated from Judah. It is remarkable, that both under the judges and kings of

Israel, this tribe produced more of the rulers than any other. Joshua, Deborah, Abdon, and Samuel, among the judges, and Jeroboam, Nadab, and several other kings of Israel were of this tribe; agreeably to Jacob's prophecy, Gen. xlviij. 19.

EPHRATAH, or Dunker's Town, a small town of the United States, in Pennsylvania, the principal settlement of the religious sect, called Dunkers or Tunkers. It lies twelve miles north of Lancaster, and sixty west of Philadelphia.

EPHRATHITES, a name synonymous with Ephraimites, and frequently applied to persons of that tribe (see Judg. xii. 5., 1 Sam. i. 1.) as well as to the natives of Bethlehem-Ephratah.

EPHREM (St.), an ancient Christian writer, in the fourth century, deacon of Edessa, was born at Nisibe, in Syria, hence styled Syrus. He was greatly esteemed by St. Basil, and St. Gregory of Nice. He wrote against the opinions of Sabellius, Arius, Apollinarius, the Manichees, &c.; and acquired such reputation, by his piety and his works, that he was called the doctor and prophet of the Syrians. He died in 378. The best editions of his works are, that of Oxford, in 1708, in folio, and that of Rome, from 1732 to 1736, in Syriac, Greek, and Latin, 6 vols. folio.

EPHREMI Codex, in biblical literature, is a manuscript of the New Testament, written on vellum, and supposed to be of high antiquity. It is 'Codex Regius 1905,' noted in the catalogue of MSS. in the royal library in Paris IX., and in all the four parts of Wetstein's Greek Testament by the letter C. It is particularly described by Griesbach in his Symbolæ, p. iii.—liv. The first part of it contains several Greek works of Ephrem the Syrian, written over some more ancient writings, which had been erased, though the traces are still visible, and in most places legible. These more ancient writings were the whole Greek Bible. The New Testament has many chasms, which are specified by Wetstein. Besides these chasms, it is in many places illegible. Wetstein contends that this MS. was written before the year 542, though his arguments are not wholly decisive. Its readings, like those of all other very ancient MSS., are in favor of the Latin; but no proof can be given that this has been corrupted from the Latin version. It has been altered by a critical collector, who, according to Griesbach, must have lived many years after the time in which the MS. was written, and has probably erased many of the ancient readings. Kuster was the first who procured extracts from it, and he inserted them in his edition of Mill's Greek Testament. Wetstein has repeatedly collated it with very great accuracy; and the numerous readings, which he has quoted from it, greatly enhance the value of his edition. A fac-simile of the characters of this MS., which is written without accents, is given by Montfaucon in his Palæographia Græca. It has many marginal notes, written in uncial letters without accents. In this MS. the disputed, or rather spurious verse, John v. 4, is written, not in the text, but as a marginal scholion. Wetstein supposed, that this was one of the MSS. which were collated at Alexandria in 616 with the new Syriac version; but, though this does not appear to have been the case, it is certainly as ancient as the seventh century. Wetstein argues, from a marginal note to Heb. viii. 7, that it was written before the institution of the feast of the purification of the virgin Mary, that is, before the year 542. *March's Michaelis*, vols. ii. and iii.

EPHRON, in ancient geography, a place of Palestine, in the tribe of Judah, about fifteen miles from Jerusalem, according to Eusebius and Jerome. Also, a mountain of Palestine, on the confines of the tribes of Judah and Benjamin, according to the book of Joshua. And, a large and strong town of Judea, in the half-tribe of Manasseh, on the other side of Jordan, over-against Scythopolis. It was situated near the torrent of Jabok. This town was taken and sacked by Judas Maccabæus, and razed to its foundations.

EPHYDOR, in antiquity, an officer in the Athenian courts of justice, who provided the plaintiff and defendant with equal water hour-glasses. When the glass was run out, they were not permitted to speak any farther; and, therefore, whilst the laws quoted by them were reciting, or if any other business intervened, the glasses were stopped.

EPHYRA, in ancient geography, a town of Greece, in Thesprotia, a province of Epirus; mentioned by Velleius, Paterculus, and Strabo; the latter of whom says, that it was afterwards called Cichyrus. Also, a town of Greece, in the Pelasgiotide, a country of Thessaly. This town was also called Cranon. Steph. Byz. Also a town of the Peloponnesus, in Arcadia. Steph. Byz. Also, a town of the Peloponnesus, in the territory of Elis, situated on the river Selleis. This place was famous for the deadly poisons which it produced.

EPIACUM, in ancient geography, a town of Albion, in the country of the Brigantes, according to Ptolemy. Camden places it at Elchester, on the river Derwent; Horsley at Hexham, in Northumberland; and Baxter supposes it was originally written Pepiacum, and places it at Papcastle, in Cumberland.

EPIBATÆ, επιβαται among the Greeks, marines, or soldiers, who served on board the ships of war. They were armed in the same manner as the land forces, only that more of them wore heavy armour.

EPIBATERION, from επιβαινω, to go abroad, a poetical composition, in use among the Greeks. When any person of condition returned home, after a long absence, he called together his friends, and rehearsed a copy of verses, wherein he returned solemn thanks to the gods for his happy return; and ended with an address by way of compliment to his fellow citizens.

EPIBATERIUM, in botany, a genus of the hexandria order and monœcia class of plants: cal. a double perianth, the outward one with six leaves, very small; the inner one three times larger than the former, with three egg-shaped leaves: cor. six petals, smaller than the interior calyx and roundish: stam. six capillary filaments, crooked, and as long as the petals: anth. roundish. Species one only; a native of the Po-

lynesian Isles: PERICARP. three roundish, monospermous plums: SEED a kidney-shaped compressed nut, somewhat furrowed.

E'PIC, *adj.* Lat. *epicus*; ἐπος. Narrative; comprising narrations, not acted, but rehearsed. It is usually supposed to be heroic, or to contain one great action achieved by a hero.

> Holmes, whose name shall live in *epic* song,
> While music numbers, or while verse has feet.
> *Dryden.*

The *epic* poem is more for the manners, and the tragedy for the passions. *Id.*

From morality they formed that kind of poem and fable which we call *epic*. *Broome.*

EPIC, or HEROIC, POEM, a poem expressed in narration, formed upon a story partly real and partly feigned; representing, in a sublime style, some signal and fortunate action, distinguished by a variety of great events, to form the morals, and affect the mind with the love of heroic virtue. We may distinguish three parts of the definition, namely, the matter, the form, and the end. The matter includes the action of the fable, under which are ranged the incidents, episodes, characters, morals, and machinery. The form comprehends the way or manner of the narration, whether by the poet himself, or by any persons introduced, whose discourses are related: to this branch likewise belong the moving of the passions, the descriptions, discourses, sentiments, thoughts, style, and versification; and besides these, the similes, tropes, figures, and, in short, all the ornaments and decorations of the poem. The end is to improve our morals and increase our virtue. See POETRY.

EPICEDION, from επι upon, and κηδος, funeral, in Greek and Latin poetry, a poetical composition, on the death of a person. At the obsequies of any man of figure, there were three kinds of discourses usually made; that rehearsed at his bustum, or funeral pile, was called nenia; that engraved on his tomb, epitaph; and that spoken in the ceremony of his funeral, epicedion. We have two beautiful epicedions in Virgil, that of Euryalus and that of Pallas.

EPICE'DIUM, *n. s.* Επικήδιος. An elegy; a poem upon a funeral.

> You from above shall hear each day
> One dirge dispatched unto your clay;
> These, your own anthems, shall become
> Your lasting *epicedium*. *Sandys's Paraphrase.*

EPICHARMUS, an ancient poet and philosopher, born in Sicily, and a disciple of Pythagoras. He is said to have introduced comedy at Syracuse in the reign of Hiero. Horace commends Plautus for imitating this poet, in following the intrigue so closely as not to give the readers or spectators time to trouble themselves with doubts concerning the discovery. He wrote likewise treatises concerning. philosophy and medicine. None of his entire works have been preserved, but some of his apophthegms have come down to us and deserve remembrance; such are the following: 'To die is an evil; but to be dead is no evil.' 'Every man's natural disposition is his good or evil dæmon.' 'He who is naturally inclined to good is noble, though his mother was an Ethiopian.' 'Be sober in thought, be slow in belief; these are the sinews of wisdom.' 'The gods set up their favors at a price, and industry is the purchaser.' 'Live so as to be prepared either for a long life or a short one.' He died aged seventy, according to Laertius, who has preserved four verses inscribed on his statue.

EPICHIREMA, επιχειρεμα, in logic, an argumentation, consisting of four or more propositions, some of which are proofs of others. The oration of Cicero for Milo may be thus reduced to the epichirema:—'Those who way-lay a man to kill him, it is lawful for him to kill, as is allowed by the laws of nature and nations, and by the practice of the best men; but Clodius way-laid Milo with that view, as appears from his forming an ambuscade before his country-house, and from his provision of weapons, soldiers, &c.' Therefore it was lawful for Milo to kill Clodius.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws should be carefully revised and examined; and, if any of them were found unsuitable to the present state of affairs, they should be repealed. This was called επιχειροτονια των νομων, from the manner of giving their suffrages by holding up their hands.

EPICŒNE, in grammar, a term applied to nouns, which, under the same gender and termination, mark indifferently the male and female species. Such in Latin is aquila, vespertilio, &c., which signify equally a male or female eagle or bat. Grammarians distinguish between epicœne and common. A noun is said to be common of two kinds, when it may be joined either with a masculine or a feminine article; and epicœne, when it is always joined to one of the two articles, and yet signifies both genders.

EPICRISIS, επικρισις, in rhetoric, a clear and brief declaration of the speaker's judgment concerning the subject in hand. Thus, ego sic statuo, in optimo imperatore quatuor has res inesse oportere, &c.' *Voss. Rhet.* lib. vi. p. 495.

EPICTETUS, a celebrated Stoic philosopher, born at Hierapolis in Phrygia, in the first century, was the slave of Epaphroditus, a freed man and one of Nero's guard. Domitian banishing all philosophers from Rome, about A. D. 94, Epictetus retired to Nicopolis in Epirus, where he died in a very advanced age; and, after his death, the earthen lamp he had used sold for 3000 drachmas. He was a man of great modesty; and used to say, 'That there was no need to adorn a man's house with rich hangings or paintings, since the most graceful furniture is temperance and modesty, which are lasting ornaments, and will never be the worse for wear.' Of all the ancient philosophers, he seems to have made the nearest approaches to true morality, and to have had the most just ideas of God and providence. He always possessed a cool and serene mind, unruffled by passion; and used to say, that the whole of moral philosophy was included in these words, *support* and *abstain*. One day his master Epaphroditus strove in a frolic to wrench his leg; when Epictetus said, with a smile, free from any emotion, 'If you go on, you will certainly break my leg:' the former

redoubling his effort, and striking it with all his strength, at last broke the bone; when Epictetus only added, 'Did not I tell you, Sir, that you would break my leg?' No man was more expert at reducing the rigor of the maxims of the Stoics into practice. He conformed himself strictly, both in his discourse and behaviour, to the manners of Socrates and Zeno. He waged continual war with fancy and fortune; and it is an excellence peculiar to him, that he admitted all the severity of the Stoics without their sourness, and reformed Stoicism as well as professed it. Besides vindicating the immortality of the soul as strenuously as Socrates, he declared openly against suicide, the lawfulness of which was maintained by the rest of the sect. Arrian, his disciple, wrote a long account of his life and death, which is lost; and preserved four books of his discourses and his Enchiridion, of which there have been several editions in Greek and Latin; and, in 1758, a translation of them into English was published by the learned and ingenious Miss Carter.

EPICURE, *n. s.* } Lat. *epicureus.* A fol-
EPICURE'AN, *adj.* } lower of Epicurus; a man
EPICUR'ISM, } given to luxury: epicu-
EPICU'RIZE, *v. n.* } rean is luxurious: epicurism, bellyism, gross pleasure: to epicurise is to feed like an epicure.

> Then fly false thanes,
> And mingle with the English *epicures.*
> *Shakspeare.*

> Tie up the libertine in a field of feasts,
> Keep his brain fuming; *epicurean* cooks,
> Sharpen with cloyless sauce his appetite. *Id.*

> Here you do keep a hundred knights and squires;
> Men so disordered, so debauched, and bold,
> That this our court, infected with their manners,
> Shews like a riotous inn; *epicurism* and lust
> Make it a tavern or a brothel. *Id. King Lear.*

The *epicure* would have pleasure and long life, though in opposition both to God's will, and his own good. *Bp. Hall.*

Some good men have ventured to call munificence, the greatest sensuality, a piece of *epicurism.* *Calamy's Sermons.*

The *epicure* buckles to study, when shame, or the desire to recommend himself to his mistress, shall make him uneasy in the want of any sort of knowledge. *Locke.*

There is not half so much *epicurism* in any of their most studied luxuries, as a bleeding fame at their mercy. *Government of the Tongue.*

> While I could see thee full of eager pain,
> My greedy eyes *epicurized* on thine. *Flatman.*

In my opinion, the body natural may be compared to the body politic; and, if this be so, how can the *epicurean's* opinion be true, that the universe was formed by a fortuitous concourse of atoms? *Swift.*

EPICUREAN PHILOSOPHY. The doctrine, or system of philosophy maintained by Epicurus and his followers, is thus stated in the comprehensive and elaborate detail of Brucker in his History of Philosophy, as translated and abridged by Dr. Enfield: and consists of three parts, Philosophy in general, Physics, and Ethics. Philosophy is the exercise of reason in the pursuit and attainment of a happy life; whence it follows, that those studies, which conduce neither to the acquisition nor the enjoyment of happiness, are to be dismissed as of no value. The end of all speculation ought to be, to enable men to judge with certainty what is to be chosen, and what to be avoided, to preserve themselves free from pain, and to secure health of body, and tranquillity of mind. Accordingly the young should apply to the study of it without delay, nor should the old be ever weary in the pursuit of it. As nothing ought to be dearer to a philosopher than truth, he should prosecute it by the most direct means, devising no fictions himself, nor suffering himself to be imposed upon by the fictions of others, neither poets, orators, nor logicians; making no other use of the rules of rhetoric or grammar, than to enable him to speak or write with accuracy and perspicuity, and always preferring a plain and simple to an ornamented style. A wise man will embrace such tenets, and only such, as are built upon experience, or upon certain and indisputable axioms. Philosophy consists of two parts:—physics, which respect the contemplation of nature; and ethics, which are employed in the regulation of manners. Of these, the latter is the most important; the knowledge of nature being only necessary as a means of promoting the happiness of life. Philosophers have added a third part, dialectics; which ought to be rejected, as only productive of thorny disputes, idle quibbles, and fruitless cavilling. In order to facilitate the pursuit of knowledge, a few plain maxims and rules may be useful. Truth is of two kinds; that which respects real existence, and that which consists in a perfect agreement between the conception of the mind and the nature of things. In order to judge rightly concerning truth, it is necessary to use some criterion, or instrument of judging. This criterion will vary according to the nature of the object which the mind contemplates. In judging of natural and moral objects the three instruments employed are sense, preconception, and passion. The maxims, or canons, pertaining to sense, are four: first, that the senses can never be deceived, and consequently, that every perception of an image, or appearance, is true; that is, that the perception or simple apprehension, and its efficient cause, the species or image flowing from the object, really agree. Secondly, opinion or judgment is consequent upon perception, and admits of truth or falsehood. Perceptions or sensations, are the effect of real external phenomena; but, when the mind judges concerning these appearances, the opinion may be either right or wrong. Thirdly, every opinion is to be admitted as true, which is attested, or not contradicted, by the evidence of the senses, after a careful and deliberate examination of every circumstance which can be supposed to affect the question. Fourthly, an opinion contradicted, or not attested by the evidence of the senses, is false. Thus the opinion of a Plenum must be false, because it contradicts the evidence of the senses, which attest that there is such a thing as motion. Concerning the second instrument of judgment, viz. προληψις, or preconception, four canons may be laid down. First, that all preconceptions are derived from the senses, either by immediate impression, as of an individual man; by enlargement or diminu-

tion, as of a giant or dwarf; by resemblance, as of an unknown city to one which has been seen; or by composition, as of a centaur. Secondly, preconception is necessary to enable us to reason, enquire, or judge of any thing. Thirdly, preconceptions, or universal notions, are the principles of all reasoning and discourse; and we easily refer to these in comparing one thing with another. If these notions be agreeable to nature, and distinctly conceived, artificial reasoning will be unnecessary. Fourthly, truths, not self-evident, are to be deduced from manifest pre-conceptions; or, where the relation of ideas is obscure, it is to be made evident by the intermediate use of some acknowledged principle. The third instrument, passion, or affection, which comprehends pleasure and pain, admits of the following four evident maxims. First, all pleasure to which no pain is annexed, is for its own sake to be pursued. Secondly, all pain, to which no pleasure is annexed, is for its own sake to be avoided. Thirdly, that pleasure, which either prevents the enjoyment of a greater pleasure, or produces a greater pain, is to be shunned. Fourthly, that pain, which either removes a greater pain, or procures a greater pleasure, is to be endured. As to the use of words, two canons are sufficient. First, in speaking, use terms in common use, and in the sense in which they are commonly understood. Secondly, in hearing, or reading, attend carefully to the signification which the speaker or writer affixes to his terms. Attention to these maxims would prevent much obscurity and confusion, and terminate many disputes. By these rules Epicurus undertook to conduct his followers into the secrets of nature, and to lay open to them the origin of things.

Epicurus adopted a variety of wild and fanciful hypotheses, which evince his incapacity of solving the grand problem concerning the origin and formation of the world. But the greatest defect of this system is the attempt of its author to account for all the appearances of nature, even those which respect animated and intelligent beings, upon the simple principles of matter and motion, without introducing the agency of a Supreme Intelligence, or admitting any other idea of fate, than that of blind necessity inherent in every atom, by which it moves in a certain direction. Hence he leaves unexplained those appearances of design, which are so manifest in every part of nature, and absurdly supposes, that the eye was not made for seeing, nor the ear for hearing. Besides the idea which he gives of the nature of the gods, whose existence he admits, as similar to man; and of their condition, as wholly separate from the world, and enjoying no other felicity except that which arises from inactive tranquillity; falls infinitely short of the true conception of an intelligent Deity.

EPICURUS was born at Gargettium in Attica, about A. A. C. 340, in the 109th Olympiad. He settled at Athens, on a fine estate he had bought; where he educated a great number of disciples, who all lived in common with their master. The respect which his followers paid to his memory is admirable: his school was never divided, but his doctrine was followed as an oracle. His birth-day was still kept in Pliny's time; the month he was born in was observed as a continual festival; and they placed his picture every where. Hence he was falsely charged with perverting the worship of the gods, and inciting men to debauchery; on which he wrote several books of devotion; recommended the veneration of the gods, sobriety, and chastity; and died of a suppression of urine, aged seventy-two.

We may thus briefly trace the subsistence and progress of the Epicurean school, after the death of its founder. From Epicurus the charge of it devolved upon his friend Hermachus; and it was continued in succession by Polystratus, Basilides, Protarchus, and others. The sect subsisted, in a depraved and degraded state, till the decline of the Roman empire. It entered Rome, indeed, in consequence of the opposition excited against it by the Stoics in Greece, under a heavy load of obloquy. This was much increased by the vehemence with which Cicero (De Fin. l. ii. Tusc. Qu. l. 1. 3. Fam. Ep. xiii. 1. Orat. in Pison. c. 22) inveighed against this sect, and by the easy credit which he gave to the calumnies industriously circulated against its founder. It was, however, patronised by several persons of distinction in Rome, and particularly by Atticus, the bosom friend of Cicero. Nevertheless, the true doctrine of Epicurus was not fully stated by any Roman writer, till Lucretius, with much accuracy of conception and clearness of method, as well as with great strength and elegance of diction, unfolded the Epicurean system in his poem, De Rerum Naturâ, On the Nature of Things. The Epicurean sect, though much degenerated from the simple manners of its founder, continued to flourish through a long course of years under the Roman emperors. This was owing in part to the freedom of manners which it permitted, and in part to the boldness with which it combated superstition; but principally to the strict union which subsisted among the members of this school, and the implicit deference which they unanimously agreed to pay to the doctrines of their master. The succession of disciples in this sect was, as Laertius attests (l. x. § 9) uninterrupted, even when other schools began to fail. In many places the doctrine of Epicurus was publicly taught, and at Athens the Epicurean school was endowed with a fixed stipend. Among the learned men of this period there were some, whose whole concern was to transmit the tenets and maxims of Epicurus uncorrupted to posterity; and others who held the memory of Epicurus in high estimation, and in many particulars adopted his doctrine, and who, therefore, may not improperly be ranked in the class of Epicureans. The principal of these are, Pliny the elder, Celsus, Lucian, and Diogenes Laertius. After the revival of letters, at a much later period, there were not wanting several learned men, who, finding little satisfaction in the obscure and subtle speculations of metaphysics, had recourse to the doctrine of Epicurus, as the true key to the mysteries of nature. The first restorer of the Epicurean system among the moderns was Daniel Sennert, an eminent physician of Wittemberg, who flourished at the beginning of the seventeenth

century. Sennert, however, confounded the corpuscles of the more ancient philosophers with the atoms of Democritus and Epicurus, and held that each element has primary particles peculiar to itself. The same doctrine was taught, with some inconsiderable variations, by Chrysostom Magnenus, professor of medicine in the university of Pavia, who, in the year 1646, published A Treatise on the Life and Philosophy of Democritus. His system was rendered obscure by an attempt to unite the incompatible dogmas of Epicurus and Aristotle. The ablest and most successful attempt towards the revival of the physical and moral philosophy of Epicurus was made by Peter Gassendi, who, besides a variety of other learned treatises, wrote a life of Epicurus, in which he undertakes to rescue that philosopher from the load of calumny under which his memory had lain for many ages, as well as to give a fair and impartial representation of his doctrine. The most celebrated followers of Gassendi were Francis Bernier, a physician of Montpelier, who wrote an Abridgement of Gassendi's Philosophy, Par. 1678, and Walter Charlton, an Englishman, who wrote a treatise, entitled Physiologia Epicuro-Gassendo Charletoniana, London, 1654, in which he attempts to establish natural science upon atomic principles. Indeed, the doctrine of atoms and a vacuum has been embraced by the most eminent philosophers. Huygens applies it to explain the cause of gravitation, and Newton admits it into his theory of natural philosophy. *Diogenes Laertius*, l. x. *Lucretius de Rerum Naturâ. Stanley's Hist. Phil.* part xiii. *Gassendus de Vitâ et Moribus Epicuri.* (*Brucker's Hist. Phil.* by Enfield).

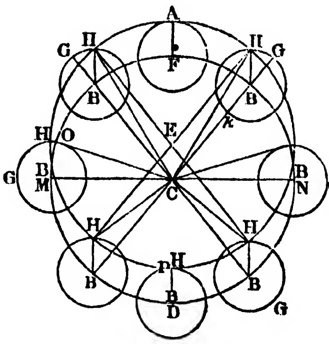
EPICY'CLE, *n. s.* Ἐπί and κύκλος, a circle. A circle whose centre is in the circumference of a greater. See below.

In regard of the *epicycle*, or lesser orb, wherein it moveth, the motion of the moon is various and unequal. *Browne.*

Gird the sphere
With centric and eccentric, scribbled o'er;
Cycle and *epicycle*, orb in orb.
*Milton's Paradise Lost.*

EPICYCLE. See ASTRONOMY.

EPICYCLE, a circle on a circle, in the ancient system of astronomy, was a subordinate orbit, or circle, which moved on the circumference of a larger one, which latter was called the deferent. By means of this epicycle, one motion, apparently irregular, was resolved into two that were circular and uniform; and, when the observed motion was so irregular and complicated as not to be represented by one epicycle, the method was to add others, till a nearer approximation was obtained. This system owed its origin to a prejudice that seems to have been extremely ancient, in favor of uniform and circular motion; and the problem that chiefly occupied the astronomers in those times, was to assign the proper proportion of the deferent and epicycle which should approximate nearest to the actual observations. The representation made by this concentric theory of the solar inequalities in longitude, was as follows:




Let C be the centre both of the earth and of the circle F B D, and let H G *k* be a smaller circle, called an epicycle, whose centre B moves uniformly in the circumference F B D from west to east, or in consequentia, while the sun moves also uniformly, and with the same velocity, in the circumference of the epicycle, in antecedentia in the upper part, but in consequentia in the lower. If the point G of the epicycle, called the apogee, as being most distant from the earth, be supposed, at the beginning of the anomalistical revolution, to be placed in the point A of O F produced; and if when it comes to G the arch G H be taken similar to F B, the point H will be the place of the sun when the centre of the epicycle has moved from F to B. If then in O F, to which B H is parallel, we take O E = B H, and on E, as a centre, with the distance E A = C F, describe the circle A H P, the sun would be seen from E to move in this circle equably; for the angle A E H is equal to the angle F C B; but seen from C, the centre of the earth, he will appear to move in it inequably, for the angle A C H in the first semicircle of anomaly, that is, in the passage of the sun from A to P, is always less than A E H or F C B: and his true place H will be less advanced in longitude than his mean B. When, again, the centre of the epicycle, or the mean place of the sun, having described a semicircle of the epicycle, will be found in P, the perigee of the orbit A H P, and his mean and true places B and H, will be seen from C to coincide as they did in A, the apogee; but in the sun's passage from P to A, that is, in the second semicircle of anomaly, his true place H, as seen from C, will be always more advanced in longitude than his mean place B; for in this semicircle the angle P C H is always greater than P E H in D C B. The angle E H C, or B C H, which is the difference between the mean and true places of the sun, is called the equation of the orbit, as being that quantity which, added to the true motion A C H of the planet in its orbit A H P, in the first semicircle of anomaly, and subtracted from it in the opposite semicircle, will render it equal to the mean motion A E H or F C B; and it is evident that the equation, or difference, will be greatest in N or M, where the centre B of the epicycle is 90° distant from either apsis. Any lines drawn from E, the centre of the orbit A H P, to the true place of the sun in H, and from C the centre of

the earth, and of the deferent FBD, to the mean place of the sun in B, are equally called the line of the mean motion of the sun, because these lines are always parallel, and mark the same point in the zodiac; and any line drawn from C to the true place of the sun, is the line of the sun's true motion.

EPIDAURUM, EPIDAURUS, or EPITAURUM, in ancient geography, a town of Dalmatia, on the Adriatic, built 430 years after the destruction of Troy; a considerable town formerly, but now reduced to a small village. See RAGUSA.

EPIDAURUS, in ancient geography, a town of Argolis, in Peloponnesus, on the Saronic Bay, south of the promontory Spiræum; called sacred, because of the religious veneration paid to Æsculapius, whose temple stood five miles from the town. Epidaurus stood in a recess of the bay, fronting the east; being enclosed by high mountains reaching the sea, and rendering it difficult of access. It had several temples, and in the acropolis or citadel was a remarkable statue of Minerva. The grove of Æsculapius was enclosed by mountains, within which all the sacrifices as well of the Epidaurians as of strangers were consumed. One was called Titthion; and on this the god, when an infant, was said to have been exposed, and to have been suckled by a she goat. Beyond the temple was the dormitory of the suppliants, and near it a circular edifice called the Tholus, built by Polycletus, of white marble. The grove, besides other temples, was adorned with a portico, and a fountain remarkable for its roof and decorations. The bath of Æsculapius was one of the benefactions of Antoninus Pius, while a Roman senator; as was also a house for the reception of pregnant women and dying persons. The remains are heaps of stones, pieces of brick wall, and scattered fragments of marble; besides some churches or rather piles of rubbish, being destitute of doors, roofs, or any kind of ornament. The statue of Æsculapius was half the size of that of Jupiter Olympius at Athens. It was made of ivory and gold; and, as the inscription proved, by Thrasymedes, son of Arignotus of Paros. He was represented sitting holding his staff, with one hand on the head of a serpent, and a dog lying by him. Two Argive heroes, Bellerophon combating with the monster Chimæra, and Perseus severing the head of Medusa, were carved on the throne. Many tablets described the cures performed by the deity, yet he had not escaped contumely and robbery. Dionysius deprived him of his golden beard, affirming that it was very unseemly in him to appear in that manner, when his father Apollo was always seen with his face smooth. Sylla amassed the precious offerings belonging to him, and to Apollo and Jupiter at Delphi and Olympia, to pay his army before Athens. A few fragments of white marble, exquisitely carved, are in the heap of the temple. In the second century six marbles remained, on which were written in the Doric dialect, the names of men and women who had been patients of the god, with the distemper each had labored under, and the remedies he had directed. Dr. Chandler found only a couple of votive inscriptions, and two pedestals of statues, one of which represented a Roman, and was erected by the Epidaurians. The stadium was near the temple, and was of earth. At the upper end were seats of stone, but these were continued along the sides only a few yards. A vaulted passage leading underneath into the area, now choked up, was a private way by which the Agonothetæ, or presidents, with the priests and persons of distinction, entered. Two large reservoirs remain, made by Antoninus for the reception of rain-water. Beyond them is a dry water-course, and in the mountain side, on the right hand, are the marble seats of the theatre, overgrown with bushes. The springs and wells by the ruins are now supposed to possess many excellent properties. To these and a good air, with the recreations of the stadium, and the medicinal knowledge and experience of the priests, may be attributed both the recovery of the sick, and the reputation of Æsculapius.

EPIDEMIA, in Grecian antiquity, festivals kept in honor of Apollo and Diana, at the stated seasons, when those deities, who could not be present every where, were supposed to visit different places in order to receive the vows of their adorers.

EPIDEM'IC, (from ἐπὶ and δῆμος, amongst the people) signifies a disease or state of sickness that prevails for a period in a vicinity, district, or tract of country. It originates always in transient external influences which gradually produce such changes in the bodily system, as finally bring on the sickness. Many epidemics appear to arise from some peculiar morbid matter in the atmosphere, brought by particular winds; such are the influenza and others of that class. The most fatal epidemic that visited Europe for many years was the cholera morbus of 1830 and 1831.

They're citizens o' th' world, they're all in all;
Scotland's a nation *epidemical*. *Cleaveland.*

He ought to have been busied in losing his money, or in other amusements equally laudable and *epidemick* among persons of honour. *Swift.*

Of all things, wisdom is the most terrified with *epidemical* fanaticism, because, of all enemies, it is that against which she is the least able to furnish any kind of resource. *Burke.*

EPIDENDRUM, in botany, a genus of the diandria order, and gynandria class of plants; natural order seventh, orchideæ. The nectarium is turbinated, oblique, and reflexed: the cor. spreading without spur. This plant produces the vanilla, which is used in making chocolate. It is a native of Mexico, and some parts of the East Indies. It is a parasitic plant; the leaves of which greatly resemble the vine, and are about eighteen inches long, and three broad. The flowers are white intermixed with stripes of red and yellow. These are quickly succeeded by pods, at first green, but afterwards yellow. The pods of the best vanilla are long, slender, and well filled with seeds. If opened, when fresh, the cavity of the pod is found to contain a humid substance that is black, oily, and balsamic, of such a strong smell, that it frequently causes head-aches, and even a sort of temporary intoxication. The season for gathering the pods be-

gins about the end of September, and lasts till the end of December. They are dried in the shade; and when dry are rubbed with oil of cocoa or calba, to render them supple, and to prevent them from becoming brittle. This fruit is only used for perfuming chocolate. In New Spain it is reckoned unwholesome, but in England, and other countries, it is a constant ingredient; and perhaps its noxious qualities may be corrected by the sea air. In those countries where they grow, the plants are easily propagated by cuttings. In this country they require to be kept in a stove, and placed near some American tree, round which they may climb for support.

EPIDERMIS. See Anatomy and Skin.

EPIDICASIA, among the Athenians. Daughters inheriting their parent's estate, were obliged to marry their nearest relation; which gave occasion to persons of the same family to go to law with one another, each pretending to be more nearly allied to the heiress than the rest. The suit was called επιδικασιας δικη; and the virgin, about whom the relations contested, επιδικας.

EPIDIDIUM, in ancient geography, the name given by Ptolemy to that peninsula of the western coast of Scotland, called Cantyre and Knapdale; and now forming part of the county of Argyle. It included the isles of Islay and Jura, which the Roman geographer considered as being part of it. The peninsula might at an early period have been an island; such changes has the sea made upon our surge-beat coasts: for 'Dr. Smith derives this name from a similar Celtic word, signifying the isle of the Picts, who at that time were the principal inhabitants of that part of Scotland.' Sir John Sinclair's Stat. Acct. vol. x. p. 519. Mr. Baxter imagines the Pepidii, synonymous with Epidii, to have derived their name from the British word Papidiauc, which signifies any thing shaped like a flute or pipe, as was the peninsula of Cantyre, the country of the Pepidii. From the southern point, called the mull of Cantyre, promontorium Epidium, the coast of Ireland may be plainly seen; it being only sixteen miles to the south foreland in Coleraine.

EPIDIDYMIS. See Anatomy.

EPIDOTÆ, deities who presided over the growth of children; worshipped by the Lacedæmonians, and invoked by those who supposed themselves persecuted by ghosts, &c.

EPIGLOTTIS. From επι, upon, and γλωττις, the tongue. The cartilage at the root of the tongue that falls upon the glottis or superior opening of the larynx, and closes it at the time of swallowing, so that nothing may pass into the lungs. See Anatomy.

EPIGONI, the sons of the seven Grecian heroes who fought in the first Theban war. The war of the Epigoni is famous in ancient history. It was undertaken ten years after the first. The sons of those who had perished in the first war, resolved to avenge the death of their fathers, and marched against Thebes, under the command of Thersander; or, according to others, of Alcmæon the son of Amphiaraus, about 1307 years before Christ. The Argives were assisted by the Corinthians, the people of Messenia, Arcadia, and Megara. The Thebans had engaged all their neighbours in their quarrel, as in one commo cause. These two hostile armies met and en gaged on the banks of the Glissas. The figl was obstinate and bloody, but victory declare for the Epigoni, and some of the Thebans fled t Illyricum, with Leodamas their general, whil others retired into Thebes, where they were soo besieged, and forced to surrender. In this wa Ægialeus was the only prince of the seven wh was killed, and his father Adrastus was the onl one who escaped alive in the first war. The his tory of this war, as Pausanias observes, wa written in verse; and Callinus, who quotes son of the verses, ascribes them to Homer, and say that next to the Iliad and Odyssey, he had neve seen a finer poem. The descendants of the ve teran Macedonians, who served under Alexande the Great, and who had children by Asiatic wo men, were also called Epigoni.

EPIGRAM, *n. s.*
Epigrammat'ic, *adj.*
Epigrammat'ical,
Epigram'matist.
} Fr. *epigramm* Lat. *epigramma*, Gr. επι and γραφω, write. A short poe or inscription, generally terminating in som witty point. See below.

A college of witcrackers cannot flout me out of n humour: do'st thou think I care for a satire or an *ep gram.* *Shakspeare*

What can be more witty than the *epigram* of Moo upon the name of Nicolaus, an ignorant physicia that had been the death of thousands? *Peacham of Poetry*

Such a customer the *epigrammatist* Martial mee withal, one who, after he had walked through t fairest street twice or thrice, cheapening jewels, pla rich hangings, came away with a wooden dish. *Peacham*

Our good *epigrammatical* poet, old Godfrey of Wi chester, thinketh no ominous forespeaking to lie names. *Camden*

> Our *epigrammatarians* old and late,
> Were wont be blamed for too licentiate.
> *Bp. Hall's Satires*

There were certain fairies in the old regions poetry, called *epigrams*, which seldom reached abo the stature of two, or four, or six lines, and whic being so short, were all turned upon conceit, or son sharp hits of fancy or wit. *Sir W. Temple*

He is every where above conceits of *epigrammat* wit and gross hyperboles: he maintains majesty the midst of plainness; he shines, but glares no and is stately, without ambition. *Addison*

> I writ
> An *epigram* that boasts more truth than wit. *Gay*

A jest upon a poor wit, at first might have had *epigrammatist* for its father, and been afterwar gravely understood by some painful collector. *Pope*

Attainment is followed by neglect, and possessi by disgust; and the malicious remark of the Gre *epigrammatist* on marriage, may be applied to eve other course of life, that its two days of happiness a the first and the last. *Johnson*

> Unfinished here an *epigram* is laid,
> And there a mantua-maker's bill unpaid.
> *Sheridan*

Epigram, επιγραμμα, originally signifies i scription. Epigrams derive their origin fro those inscriptions placed by the ancients on the tombs, statues, temples, triumphal arches, & These, at first, were only simple monograms; terwards increasing their length, they made the in verse, to be the more easily retained: Her

dotus, and others, have transmitted to us several of them. Such little poems retained the name of epigrams, even after the design of their first institution was varied, and the people began to use them for the relation of little facts and accidents, the characterising of persons, &c. Some critics require the epigram constantly to close with something poignant and unexpected, to which all the rest of the composition is only preparatory; while others, on the contrary, maintain that the thought should be equally diffused throughout the poem without laying the whole stress on the close; the former is usally the practice of Martial, and the latter that of Catullus. The Greek epigrams have scarcely any thing of the point or briskness of the Latin ones; those collected in the Anthology have most of them a remarkable air of ease and simplicity, attended with something just and witty. Though they want the salt of Martial, yet they are not insipid; however the general faintness and delicacy of the pleasantry in them, has given occasion for a Greek epigram, or epigram à la Greque, to denote, among the French, an epigram void of sharpness. We subjoin one or two of the best examples of the epigram: On the miracle of turning the water into wine at Cana. John ii.

Vidit et erubuit lympha pudica Deum.

From Martial.

When Arria from her wounded side
To Pætus gave the reeking steel,
I feel not what I've done—she cried;—
What Pætus is to do, I feel.

By Dr. Doddridge,

On the motto to his family arms, 'Dum vivimus vivamus.'

Live while you live, the epicure would say,
And seize the pleasures of the present day.
Live while you live, the sacred preacher cries,
And give to God each moment as it flies.
Lord, in my views let both united be;
I live in pleasure when I live to Thee.

See also a beautiful epigram of Dr. Clarke's in our account of his life.

EPIGASTRIC Region, in anatomy, one of those portions into which the cavity of the abdomen is divided. 'The epigastric region,' says Winslow, 'begins immediately under the appendix ensiformis at a small superficial depression, called the pit of the stomach, and in adult subjects ends above the navel at a transverse line, supposed to be drawn between the last false ribs on each side. This region is subdivided into three parts, one middle, named epigastrium, and two lateral, termed hypochondria. The epigastrium takes in all that space which lies between the false ribs of both sides; and the hypochondria are the spaces covered by the false ribs.' *Sect.* 7. 79, and 80.

EPILEPSY, *n. s.* } 'Επίληψις. A convul-
Epilep'tic, *adj.* } sive motion of the whole body, or some of its parts, with a loss of sense. Epileptic, convulsed with epilepsy, or liable to this disease.

A plague upon your *epileptick* visage!
Smile you my speeches, as I were a fool?
*Shakspeare.*

My lord is fell into an *epilepsy*:
This is the second fit. *Id. Othello.*

Melancholy distempers are deduced from spirits drawn from that cacochymia; the phrenitis from cholerick spirits, and the *epilepsy* from fumes.
*Floyer on the Humours.*

*Epilepticks* ought to breathe a pure air, unaffected with any steams, even such as are very fragrant.
*Arbuthnot on Diet.*

One of these sleep-walkers I have frequently seen: once she smelt of a tube rose, and sung, and drank a dish of tea in this state; her awaking was always attended with prodigious surprise, and even fear; this disease had daily periods, and seemed to be of the *epileptick* kind. *Darwin.*

Unless with people who too much have quaffed,
And have a kind of wild and horrid glee,
Half *epileptical*, and half hysterical:
Their preservation would have been a miracle.
*Byron.*

Epilepsy. See Medicine.

EPILLA, a town of Spain, in Arragon, on the Xalon. Population 3200. Seventeen miles west of Saragossa.

EPILOBIUM, the willow-herb, in botany, a genus of the monogynia order, and octandria class of plants; natural order seventeenth, calycanthemæ: cal. quadrifid; petals four; caps. oblong inferior; seed pappous or downy. There are thirteen species; several of them natives of Britain. They grow in marshes, or under hedges in moist and shady places; having blossoms generally of a red color, and sometimes of considerable beauty. The most remarkable are, 1. E. angustifolium, or rosebay willow-herb. An infusion of the leaves has an intoxicating quality, as the inhabitants of Kamptschatka have learned. These people also eat the white young shoots which creep under the ground, and have a sort of ale brewed from the dried pith of it. The down of the seeds has been lately manufactured, by mixing it with cotton, or beaver's hair. 2. E. hirsutum. The top-shoots of this plant have a very delicate fragrancy; but so transitory, that before they have been gathered five minutes, it is no longer perceptible. Horses, sheep, and goats eat this plant; cows are not fond of it; swine refuse it.

EPILOGUE, *n. s.* Fr. *epilogue*; Lat. *epilogus.* The poem or speech at the end of a play.

If it be true that good wine needs no bush, 'tis true that a good play needs no *epilogue*; yet to good wine they do use good bushes, and good plays prove the better by the help of good *epilogues*. *Shakspeare.*

Are you mad, you dog?
I am to rise and speak the *epilogue*.
*Dryden.*

Epilogue, in oratory, the conclusion of a discourse, ordinarily containing a recapitulation of the principal matter delivered.

*The* Epilogue, in dramatic poetry, is addressed to the audience, after the play is over, by one of the principal actors; and usually contains some reflections on certain incidents in the play, especially those in the part of the person that speaks it. Having somewhat of pleasantry, it is intended to compose the passions excited by the representation.

EPIMEDIUM, barren-wort, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order twenty-fourth, corydales. Nectaria four, cup-shaped, and lying on the petals: cor. tetrapetalous; cal. dropping off;

SEED vessel a pod. The only species is the E. alpinum, a low herbaceous plant, with a creeping root, having many stalks about nine inches high, each of which has three flowers, composed of four leaves placed in the form of a cross. Their color is reddish, with yellow stripes on the border.

EPIMENIDES, an ancient poet and philosopher, born at Gnossus in Crete. Contrary to the custom of his country, he always wore his hair long; which, according to some, was because he was ashamed of being thought a Cretan: and indeed he does not seem to have had a high opinion of his countrymen, if that verse cited by St. Paul 'The Cretans are always liars, evil beasts, slow bellies,' be his, as is generally believed. His reputation was so great over all Greece, that he was esteemed a favorite of the gods. The Athenians being afflicted with the plague, and commanded by the oracle to make a solemn lustration of the city, sent Nicias, the son of Niceratus, with a ship to Crete, to desire Epimenides to come to them. He accepted their invitation, accompanied the messengers to Athens, performed the lustration of the city, and the plague ceased. Here he contracted an acquaintance with Solon, who consulted him on the regulation of the Athenian commonwealth. He is said to have looked on the port of Munychia, and said, 'How blind is man to future things! for did the Athenians know what mischief will one day be derived to them from this place, they would eat it with their teeth.' This prediction was thought to be accomplished 270 years after, when Antipater constrained the Athenians to admit a Macedonian garrison into that place. On his leaving Athens, the citizens offered him many valuable presents and honors, and appointed a ship to carry him back to Crete: but he would accept of nothing except a branch of the sacred olive preserved in the citadel; and desired the Athenians to enter into an alliance with the Gnossians. Having obtained this, he returned to Crete, where he died soon after, aged 157 years; or, as the Cretans pretended, consistently with their character, 299 years. He was also a poet, and wrote verses on the Genealogy of the Gods, on the Building of the ship Argo, and Jason's Expedition to Colchis, and concerning Minos and Rhadamanthus. He wrote also in prose, Concerning Sacrifices and the Commonwealth of Crete. St. Jerome likewise mentions his Books of Oracles and Responses. The Lacedæmonians procured his body, and preserved it among them by the advice of an oracle; and Plutarch tells us that he was reckoned the seventh wise man by those who refused to admit Periander into the number.

EPIMETHEUS, in fabulous history, a son of Japetus and Clymene, who married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curiosity to open the box which Pandora had brought with her, and thence issued a train of evils, which from that moment have never ceased to afflict the human race. Hope only remained at the bottom of the box, and it is she alone which comforts men under misfortunes. Epimetheus was changed into a monkey by the gods, and sent into the island Pithecusa.

EPIMETRON, επι and μετρον, measure, in Roman antiquity, an allowance given to the tax-gatherers in the Roman provinces, over and above the just quantity of wine or grain they were obliged to furnish. The epimetron, or over-measure, was different in different provinces being always greater in those that were remote The different kinds of things wherein it was given made likewise a difference in the quantity allowed. The reason of allowing an epimetron, or over-measure, was to make good the leakage of the wine, and waste of grain, that would necessarily happen by transporting it to Rome The provinces whose taxes were converted into money, and paid in specie, were free from epimetron.

EPINAL, a town of Lorraine, France, the capital of the department of the Vosges. The river Moselle divides it into two parts; it is well built, has a few manufactures, and a good trade in cattle and timber. Population 7500. Ten miles north-west of Remiremont.

EPINAY, a town of France, between Lille and Douay, containing about 2000 inhabitants.

EPINGEN, a town of Germany, in the duchy of Baden, with 2450 inhabitants. It is eighteen miles S. S. E. of Heidelberg.

EPINYCTIS, *n. s.* Gr. ἐπινυκτις. A sore at the corner of the eye.

The *epinyctis* is of the bigness of a lupin, of a dusky red, and sometimes of a livid and pale colour, with great inflammation and pain. *Wiseman's Surgery.*

EPIPHANIUS (St.), an ancient father of the church, born at Besanducan, a village in Palestine, about A. D. 332. He founded a monastery near the place of his birth, and presided over it. He was afterwards elected bishop of Salamis; when he took part with Paulinus in opposition to Meletius, and ordained in Palestine, Paulinian, the brother of St. Jerome; on which a contest arose between him and John, bishop of Jerusalem. He afterwards called a council in the island of Cyprus, in which he procured a prohibition of the reading of Origen's writings, earnestly endeavoured to prevail on Theophilus, bishop of Alexandria, to engage St. Chrysostom to declare in favor of that decree: but, not meeting with success, he went himself to Constantinople, where he would not have any communication with St. Chrysostom; and formed the design of entering the church of the apostles, to publish his condemnation of Origen; but, being informed of the danger to which he would be exposed he resolved to return to Cyprus: but died at sea in 403. His works were printed in Greek at Basil, 1544, in folio; and afterwards translated into Latin, in which language they have often been reprinted. Petavius revised and corrected the Greek text by two manuscripts, and published it together with a new translation at Paris in 1622. This edition was reprinted at Cologne in 1682.

EPIPHANY, *n. s.* Fr. *epiphoneme*, Ital. Span. and Port. *epifonema*; Gr. ἐπιφανεια, manifestation. A church festival, celebrated on the twelfth day after Christmas, in commemoration of our Saviour's being manifested to the world

Thou
Glorifiedst poverty,
And yet soon after riches didst allow,

By accepting kings' gifts in the *Epiphanie*;
Deliver, and make us to both ways free!
*Donne.*

The EPIPHANY was not originally a distinct festival, but a part of that of the nativity of Christ, which being celebrated twelve days, the first and last of which were high days of solemnity, either of these might properly be called epiphany, as implying the appearance of Christ in the world. The word in the original Greek, επιφανεια, signifies appearance or apparition; and was applied, as some suppose, to this feast, on account of the star which appeared to the magi. The offerings of the wise men to the infant Jesus are commemorated on epiphany, or twelfth-day. St. Jerome and St. Chrysostom take the epiphany for the day of our Saviour's baptism, when he was declared to men by the voice from heaven. Matt. iii. 17. And accordingly it is still observed by the Cophtæ and Ethiopians in that view. Others contend that the feast of Christmas was held in divers churches on this day; which had the denomination epiphany from our Saviour's first appearance on earth at that time. The word is used among the ancient Greek fathers, not for the appearance of the star to the magi, but for that of our Saviour to the world: in which sense St. Paul uses it, in his Second Epistle to Timothy, i. 10.

EPIPHONEMA, *n. s.* Gr. επιφώνημα, επι and φονεω, to call. An exclamation; a conclusive sentence not closely connected with the words foregoing.

I know a gentleman, who made it a rule in reading to skip over all sentences where he spied a note of admiration at the end. If those preachers who abound in *epiphonemas* would but look about them, they would find one part of their congregation out of countenance, and the other asleep, except perhaps an old female beggar or two in the aisles; who, if they be sincere, may probably groan at the sound. *Swift.*

The synonymous parallelism, which repeats the sense of a former clause in different words, is considered as one kind of *epiphonema* by Demetrius Phalereus, as it is placed by him among the embellishments of style. *Abp. Newcome.*

EPIPHONEMA, Επιφωνεμα, exclamation, in rhetoric, a sententious exclamation, frequently added after a narrative, or rehearsal of any thing remarkable; containing usually a lively, close reflection on the subject there spoken of, and intended to give it greater force, and render it more affecting to the hearers. Such is that of St. Paul, when, after discoursing of the rejection of the Jews, and the vocation of the Gentiles, he cries out, 'O the depth of the wisdom and knowledge of God!' This figure is frequently expressed in a way of admiration. Such is that of Cicero, when, after having observed, that all men are desirous of living to an advanced age, but uneasy under it when attained, he makes this just reflection upon their conduct:—'So great is their inconstancy, folly, and perverseness!' (Cic. de Senect. c. 2). The epiphonema is usually expressive of the milder and more gentle passions, and is not so vehement and impetuous as exclamation.

EPIPHORA, in medicine, the watery eye; a genus of diseases in the class locales, and order apocenoses of Cullen. The humor which flows so copiously from the eye, in epiphora, seems to come not only from the lachrymal gland, but from the whole surface of the caruncula lachrymalis, and of Melibomius's glands. It is generally occasioned by some external blow, by sand, acrid fumes, and the like, or by some disease, as the scrofula, measles, small-pox, &c.; or it arises from an obstruction in the lachrymal canal, so that the tears cannot pass to the nose. See MEDICINE.

EPIPHYSIS, *n. s.* 'Επιφυσις. Accretion; the part added by accretion; one bone growing to another by simple contiguity, without any proper articulation.

The *epiphysis* of the os femoris is a distinct bone from it in a child, whereas in a man they do entirely unite. *Wiseman.*

EPIPHYSIS. See ANATOMY.

EPIPLOCELE, in medicine, a kind of hernia, or rupture, in which the omentum subsides into the scrotum.

EPIPLOOMPHALON, an hernia umbilicalis, proceeding from the omentum, falling into the region of the navel.

EPIRUS, a district of ancient Greece, bounded on the east by Etolia, on the west by the Adriatic, on the north by Thessaly and Macedon, and on the south by the Ionian Sea. According to Josephus, it was first peopled by Dodanim, the son of Javan, and grandson of Japhet. The people were very warlike: but they remained in a savage state long after their neighbours were civilised; whence the islanders used to threaten their offenders with transportation to Epirus. Their horses were in great request among the ancients; as well as the dogs produced in one of the divisions called Molossus, called by the Romans Molossi. The history of Epirus commences with the reign of Pyrrhus, the son of Achilles, by Deidamia, the daughter of Lycomedes, king of Scyros. He is said to have behaved with great bravery at the siege of Troy; but, it appears, with no less barbarity. After the city was taken, he killed the old king Priam with his own hand; threw Astyanax, the son of Hector and Andromache, headlong from a high tower; and sacrificed Polyxena, the daughter of Priam, on the tomb of his father. He carried Andromache with him into Epirus, where he settled by the advice of the famous soothsayer Helenus, one of Priam's sons, who had served during the Trojan war both under his father and himself. But the most remarkable period of the history of Epirus is the reign of Pyrrhus II., who made war upon the Romans. He was invited into Italy by the Tarentines; and embarked about A. A. C. 280. After having escaped many dangers by sea, he landed in that country, and with great difficulty gained a victory over the Romans; he was afterwards, however, utterly defeated by them, and obliged to return into his own country. See ROME. To retrieve his honor, he then undertook an expedition against Macedon; where he overthrew Antigonus, and at last made himself master of the whole kingdom. He then formed a design of subduing all the other Grecian states; but met with such an obstinate resistance at Lacedæmon, that he was obliged to drop the enterprise; and was soon after killed at

the siege of Argos by a woman, who, from the wall, threw a tile upon his head. Deidamia, the grand-daughter of Pyrrhus, was the last who sat on the throne of Epirus. She is said to have been murdered after a short reign; upon which the Epirots formed themselves into a republic. Under this government Epirus never made any considerable figure, but seems rather to have been dependent on the kingdom of Macedon. The Romans having conquered Philip, king of that country, restored the Epirots to their ancient liberty; but they, forgetful of this favor, soon after took up arms in favor of Perseus. As a punishment for this ingratitude, the Romans gave orders to Paulus Emilius, after the reduction of Macedon, to plunder the cities of Epirus, and level them with the ground. This was executed throughout the whole country on the same day, and at the same hour. The booty was sold, and each foot soldier had 200 denarii, that is £6 9s. 2d., and each of the horse double this sum; 100,000 men were made slaves, and sold to the best bidder, for the benefit of the republic. Nor did the vengeance of Rome stop here; all the cities of Epirus, to the number of seventy, were dismantled, and the chief men of the country carried to Rome, where they were tried, and most of them condemned to perpetual imprisonment. After this terrible blow, Epirus never recovered its ancient splendor. Upon the dissolution of the Achæan league, it was made part of the province of Macedon; but, when Macedon became a diocese, Epirus was made a province of itself, and called the province of Old Epirus, to distinguish it from New Epirus, another province lying east of it. On the division of the empire, it fell to the emperors of the east, and continued under them till the taking of Constantinople by the Latins, when Michael Angelus, a prince nearly related to the Greek emperor, seized on Etolia and Epirus, of which he declared himself despot, or prince; and was succeeded by his brother Theodorus, who took several towns from the Latins, and so far enlarged his dominions, that, disdaining the title of despot, he assumed that of emperor, and was crowned by Demetrius, archbishop of Bulgaria. Charles, the last prince of this family, dying without lawful issue, bequeathed Epirus and Acarnania to his natural sons, who were driven out by Amurath II. Great part of Epirus was afterwards held by the noble family of the Castriots; who, though they were masters of all Albania, yet styled themselves princes of Epirus. Upon the death of the famous George Castriot, surnamed Scanderbeg, Epirus fell to the Venetians, who were soon dispossessed of it by the Turks; in whose hands it still continues, being now included in ALBANIA, which see.

EPIS'COPACY, *n. s.* } Lat. *episcopatus.*
EPIS'COPAL, *adj.* } Government of or by
EPIS'COPATE, *n. s.* } bishops; of or relating
to bishops: episcopal is the office or dignity of a bishop.

The plot of discipline sought to erect a popular authority of elders, and to take away *episcopal* jurisdiction. *Hooker.*

The bishops durst not contest with the assembly in jurisdiction; so that there was little more than the name of *episcopacy* preserved. *Clarendon.*

Prelacy itself cannot be proved by prescription, since *episcopacy* is not prescribed by any time whatsoever. *Ayliffe.*

These qualities, at length, deservedly conducted you to the *episcopate.* *Arnold.*

The apostle commands Titus not only to be a pattern of good works himself, but to use his *episcopal* authority in exhorting every rank and order of men. *Rogers.*

The father, who designs his babe a priest,
Dreams him *episcopally* such at least. *Cowper.*

EPISCOPACY is that form of church government in which diocesan bishops are established, as distinct from, and superior to priests or presbyters. The ministers of religion have long been distinguished into different orders; but it has been much controverted whether the distinction be of divine or human right. See the article BISHOP.

EPISCOPALIANS, in church history, an appellation given to those who prefer the episcopal government and discipline.

EPISCOPALIANS, SCOTCH, differ from those of England, upon some particular ecclesiastical points. In an account of the episcopal church of Scotland, drawn up by one of its members, it is observed, that the real tenets of the Scotch episcopalians, or members of what was once the established church of Scotland, seem to be very imperfectly understood. During the Reformation from popery, there was little order or decency observed in the worship of the reformed church; but this was abolished in the reign of James VI., and episcopacy established on very liberal principles. The episcopal form of worship now obtained the sanction of the most respectable part of the nation, and it continued to flourish under the patronage of government, till it was overthrown by the zealots for the national covenant. It was, however, restored in 1662, and prevailed, in some measure, for twenty-seven years, till, through the influence of the advocates for the prince of Orange, it was again overthrown. Here it is to be remarked that, even while established and supported by government, the Scotch episcopal church had no public liturgy: the English book of Common Prayer was indeed made use of by the first reformers, and there seems little reason to doubt but that John Knox himself sometimes countenanced set forms of prayer, and encouraged clerical subordination; but his successor, Andrew Melvil, a man greatly inferior to him in learning and knowledge, introduced an equality among the clergy, and, at the same time, was so successful in exciting the indignation of the people against the liturgy, that when an attempt was made to modify the prayer book, so as it might be used by the church of Scotland, the solemn league and covenant was entered into: and the ruin of the unfortunate Charles was the result. The episcopalians were treated with some degree of severity during the reign of William III., on account of their scrupulously declining to proffer the same allegiance to him which they had sworn to king James. They were prohibited, it is said, from officiating on the sabbath day, except in their own hired houses, where they received such friends as chose to come in unto them. Their worship was conducted in this manner, praying

either extempore, or from premeditation, till queen Anne ascended the throne, after which the English liturgy was gradually introduced into Scotland, under the authority of an act of parliament, passed on the 3rd of March, 1712; one clause of which was, 'to prevent the disturbing of those of the episcopal communion in that part of Great Britain called Scotland, in the exercise of their religious worship, and in the use of the liturgy of the church of England.' It was publicly known, however, that they were much attached to the house of Stuart, in consequence of which, when the rebellion broke out in 1715, they were laid under several restraints; but these were neither of a severe nature, nor of any long continuance, for in 1720 their places of worship were as numerous as they had been formerly, and they were attended by members of the most eminent and respectable characters in the kingdom, of whom not a few held appointments under government. Before this time Dr. Sancroft, archbishop of Canterbury, with five other bishops, who were extremely popular, being deprived of their sees for refusing their allegiance to king William, occasioned a schism in the church of England. Among other matters of dispute, different opinions were entertained respecting the nature and design of the Lord's supper, and the controversy infected the episcopalians in Scotland. At such a critical period, the introduction of prayers into public worship in behalf of departed friends was certainly, to call it no worse, a very impolitic measure, every thing savoring of popery being held in the utmost abhorrence. After the death of Dr. Rose, the proscribed bishop of Edinburgh, in 1720, such of the presbyters as had been promoted to the episcopal dignity opposed the diocesan form of church government, and a proposal was made of a college of bishops to govern the whole church; but for the adoption of this scheme the annals of history could furnish no precedent, and of course many of the most enlightened bishops were successful in their opposition to it. An undue attachment to the family of Stuart was long a general charge against the Scotch episcopalians, insomuch that it has been regarded by many as their most distinguishing tenet; but the public opinion of this matter was not a little exaggerated. That the Almighty, and not the people, is the ruler of princes, they have uniformly maintained; and this shows that in as far as a republican or levelling spirit has been imputed to them, it has been without foundation. Various restraints were, from time to time, laid on the Scotch Episcopalians, with a view to cut off their attachment to the Stuart family; but, by an act passed in 1792, these were happily removed, and, with other dissenters, they were allowed the enjoyment of free toleration. About this time the oaths of abjuration and allegiance were taken by the generality of the Scotch episcopal clergy. The writer above noticed, whom we have chiefly followed in this account, also observes, that there are in Scotland chapels quite distinct from the Scotch episcopal church, where the liturgy of the church of England is used by clergymen ordained either in England or Ireland but that these chapels are strictly and properly independent of each other, and under the guardianship of no bishop; so that those who attend them might, with much more propriety, be styled congregationalists than episcopalians.

EPISCOPIUS (Simon), a learned author of the seventeenth century, and a great supporter of the Arminians, was born at Amsterdam in 1583. In 1612 he was chosen professor of divinity at Leyden, in the room of Gomarus, who resigned; and in this station he entered eagerly into the Arminian controversy. The states of Holland having invited Episcopius to take his place at the Synod of Dort, he went thither accompanied by some remonstrant ministers; but the synod would not allow them to sit as judges, nor to appear in any other capacity than as persons summoned before them: they submitted, were deposed, and banished. They then retired to Antwerp, but Episcopius returned to Holland in 1626, and was made minister of the church of Remonstrants at Rotterdam. In 1634 he was chosen rector of the college founded by the Arminians at Amsterdam, where he spent the remainder of his days. He died in 1643, of a retention of urine. His works make two volumes in folio, of which the second consists of posthumous publications.

EPISODE, *n. s.* }
EPISOD'IC, *adj.* } Gr. ἐπισωδε. An incidental narrative, or digression in a poem, separable
EPISOD'ICAL. }
from the main subject, yet rising naturally from it.

*Episodical* ornaments, such as descriptions and narrations, were delivered to us from the observations of Aristotle. *Dryden.*

I discover the difference between the *episodick* and principal action, as well as the nature of episodes. *Notes on the Odyssey.*

The poem hath no other *episodes* than such as naturally arise from the subject. *Addison's Spectator.*

EPISPASTIC, *n. s.* Επι and σπάω, to draw. Drawing or blistering

The matter ought to be solicited to the lower parts, by fomentations, bathing, *epispasticks*, and blistering. *Arbuthnot.*

EPISPASTICS, in medicine, are topical dies, which, being applied to the external parts of the body, attract the humors to them.

EPISTATES, Επιςατης, derived from επι, over, and ιςημι, I stand, in antiquity, a person who has the command and direction of an affair, or of a people. The term is used in speaking of the government of Athens, where the epistates was the senator in command for that day, or whose turn it was to preside that day. The constitution was this: the ten tribes of Athens, formed by Clisthenes, elected every year, by lot, each of them fifty senators, which made a senate of 500. Every tribe had the precedence in its turn, and surrendered it again successively to another The fifty senators in office were called prytanes; the particular place where they assembled, prytaneum; and the term, or duration of their office, viz. thirty-five days, prytanea. During these thirty-five days, ten of the fifty prytanes presided weekly, under the name of proedri; and of these proedri there was one to preside each day of the week, under the title of epistates. No person was allowed to hold his office more than once in his whole life, lest he should acquire too much

the taste of dominion: the senators of all the other tribes still voted, according to the order the lot had given them; but the prytanes laid the business before them, and the epistates took their votes and opinions. Of the ten proedri of each week, there were but seven that could preside each his day in the quality of epistates; the ten proedri elected the seven prytanes.

EPISTAXIS. From επιϛαζω, to distil from. Bleeding at the nose, with pain, or fulness of the head. A genus of disease arranged by Cullen in the class pyrexiæ, and order hæmorrhagiæ.

EPISTEMONARCH, in the ancient Greek church, an officer of great dignity, who had the care of every thing relating to faith, in the quality of censor: the office was nearly similar to that of master of the sacred palace at Rome.

EPI'STLE, *n. s.* } Fr. *epistre;* Ital. Span.
EPI'STOLARY, *adj.* } Port. and Lat. *epistola;* Gr. ἐπιϛολὴ, a letter: relating or suitable to letters.

> When loose *epistles* violate chaste eyes,
> She half consents who silently denies. *Dryden.*

*The* EPISTLES of the New Testament may be thus exhibited:—

I. A Table of St. PAUL'S EPISTLES, in the order of time, with the places where, and the times when they were written.

| Epistles. | Places. | | A. D. |
|---|---|---|---|
| 1 Thessalonians, 2 Thessalonians | Corinth | | 52 |
| Galatians | Corinth or Ephesus | Near the end of / or the beginning of | 52 / 53 |
| 1 Corinthians | Ephesus | The beginning of | 56 |
| 1 Timothy | Macedonia | | 56 |
| Titus | Macedonia, or near it, | Before the end of | 56 |
| 2 Corinthians | Macedonia | About October | 57 |
| Romans | Corinth | About February | 58 |
| Ephesians | Rome | About April | 61 |
| 2 Timothy | Rome* | About May | 61 |
| Philippians | Rome | Before the end of | 62 |
| Colossians | Rome | Before the end of | 62 |
| Philemon | Rome | Before the end of | 62 |
| Hebrews | Rome, or Italy, | In the spring of | 63 |

II. A Table of the SEVEN CATHOLIC EPISTLES, so called because they were written to Christians in general, and the Revelation, with the places where and the times when they were written.

| Epistles. | Places. | | A. D. |
|---|---|---|---|
| The Epistle of St. James | Judea | 61 or beginning of | 62 |
| The 2 Epistles of St. Peter | Rome | | 64 |
| St. John's 1st Epistle | Ephesus | About | 80 |
| His 2d and 3d Epistles | Ephesus | Between | 80 and 90 |
| The Epistle of St. Jude | Unknown | | 60 or 65 |
| The Revelation of St. John | Patmos or Ephesus | | 95 or 96 |

See *Lardner's Credibility of the Gospel History*, vol. xvi. and vol. xvii.

The learned are not absolutely agreed as to the dates of these several epistles, nor the places whence they were written. It would lead us too far to examine and produce the various authorities and arguments that have been used for settling these particulars; we need only mention that Dr. Doddridge dates the first Epistle to the Corinthians about the year 57; and the second Epistle in 58; those to the Ephesians, Philippians, Colossians, and Philemon, in 63; the first to Timothy, in 58 or 65; the second to Timothy, in 66 or 67; the Epistle to Titus, between St. Paul's first and second imprisonment at Rome; the Epistle of St. James, in 60 or 61; the first of Peter in 61; the second in 67; that of St. Jude some time after the second of Peter, according to Dr. Mills in the year 90.

As to the general design of these several epistles, it is observed by Dr. Doddridge, that the Epistle to the Romans is intended to fix in the minds of the Christians, to whom it is addressed, a just sense of the excellency of the gospel, and to engage them to act in a manner agreeable to their profession of it; the Epistles to the Corinthians are designed to resolve some important queries proposed by them, and to correct the various criminal irregularities and disorders of which they were guilty; the principal design of the Epistle to the Galatians was to assert and vindicate the apostle's authority and doctrine, and to confirm the churches of Galatia in the faith of Christ, especially with respect to the important point of justification; to expose the errors that were introduced among them, and to revive those principles of Christianity which he had already taught them. In the Epistle to the Ephesians, that apostle endeavours to establish them in the faith; and, to this end, to give them more exalted views of the divine love and the excellence of Christ; to show them that they were now, though Gentiles, made partakers of equal privileges with the Jews; to encourage them by his own example and concern for their welfare; and to engage them to the practice of duties becoming their Christian character. The Epistle to the Philippians is designed to comfort them under the concern they felt on his account; to check a party-spirit that had broken out among them, and to promote union and affection; to guard them against the seduction of judaising

teachers; to support them under their trials, and to inspire them with an ambition of excelling in ornamental and distinguished spiritual attainments. The Epistle to the Colossians is designed to excite them to a temper and conduct worthy of their sacred character, and to secure them from the influence of those Pagan sophists, or Jewish bigots, who endeavoured to seduce them from the purity of the Christian faith. The two Epistles to the Thessalonians are intended to confirm them in their adherence to the Christian faith, and to engage them from the sufferings they had already endured, and the extraordinary character they had hitherto maintained, to make great advances, and to excel still more in religion and virtue; and also to rectify some erroneous apprehensions they entertained about the coming of Christ, and to direct them in the proper exercise of Christian discipline. The first Epistle of Timothy was partly intended to direct him in managing the affairs of the church, and choosing proper persons for the various offices it required; and partly to caution him against the influence of judaising teachers, to urge him to pay a constant regard to the interests of practical religion, and to animate him to diligence, fidelity, and zeal. The second epistle prepares Timothy for the sufferings that awaited him, forewarns him of the apostasy that was beginning to appear in the church, and animates him to the persevering discharge of every part of the ministerial office. The Epistle to Titus contains a variety of prudent instructions and cautions. The design of the Epistle to the Hebrews was to confirm the Jewish Christians in the faith and practice of the gospel, which they might be in danger of deserting through the insinuation or ill-treatment of their persecutors. St. James, in his epistle, aims to correct those errors, both in doctrine and practice, into which the Jewish Christians had fallen, which might otherwise have produced fatal consequences; and then to establish the faith, and animate the hope, of sincere believers, under their present and approaching sufferings. The Epistles of St. Peter are designed to induce the Christian converts, in various parts of the world, to maintain a conduct inoffensive and amiable; to support them under their trials, and to encourage their constancy, notwithstanding the artifices of false teachers, and the persecution of their most inveterate enemies. The leading design of St. John, in his first epistle, is to evince the vanity of faith separate from morality; to inspire the minds of Christians with mutual charity, and to guard them against the snares and efforts of Antichrist, and of all who were endued with his spirit. The Epistle of Jude describes the characters of the false teachers, represents the divine judgments which such persons had reason to expect, and thus cautions Christians against being perverted by them. See *Doddridge's Family Expositor*, vol. iv. v. and vi. in the general introduction prefixed to each epistle.

Epistles and Gospels, in the liturgy of the church of England, are select portions of scripture taken out of the writings of the evangelists and apostles, and appointed to be read in the communion service, on Sundays and holydays. They are thought to have been selected by St. Jerome, and by him put into the lectionary. It is certain they were very anciently appropriated to the days whereon they are now read, as they are commented upon in the homilies of several ancient fathers, preached upon those days, to which these portions of Scripture are now affixed. See Collect.

EPI'STOLARY, *adj.* From epistle.

I shall carry on an *epistolary* correspondence between the two heads. *Addison.*

EPISTROPHE, Επιστροφη. In rhetoric, a figure wherein that which is supposed of one thing is strongly affirmed of another, and the repetition of the same word occurs at the end of each member or sentence.

E'PITAPH, *n. s.* Fr. *epitaphe;* Ital. Span. and Port. *epitasio, epitaphio;* Lat. *epitaphium;* Gr. ἐπιτάφιος. An inscription upon a tomb.

Live still, and write mine *epitaph*. *Shakspeare.*

Some thy loved dust in Parian stones enshrine,
Others immortal *epitaphs* desig.. ,
With wit and strength that only yields to thine. *Smith.*

In vain advertisements the town o'erspread;
They're *epitaphs*, and say the work is dead. *Young.*

Where are the *epitaphs* our fathers read?
Save a few gleaned from the sepulchral gloom
Which once-named myriads nameless lie beneath,
And lose their own in universal death. *Byron.*

Epitaph is derived from επι, upon, and ταφος, a sepulchre. It has been disputed whether the ancient Jews inscribed epitaphs on the monuments of the dead; but it is certain some of very ancient date are found amongst them. The Athenians put only the name of the dead with the epithet χρηστος good, or ἥρως hero, and the word χαιρε, signifying their good wishes. The name of the deceased's father and his tribe were frequently added. The Lacedæmonians allowed epitaphs to none but those who had died in battle. The Romans inscribed their epitaphs to the manes, diis manibus; and frequently introduced the dead, by way of prosopopœia, speaking to the living; of which we have a fine instance wherein the dead wife thus bespeaks her surviving husband:—

Immatura peri; sed tu, felicior, annos
Vive tuos, conjux optime, vive meos.

The epitaphs of modern times too often consist of fulsome compliments and expressions of respect, which were never applied to the deceased while in life. Hence the English proverb, 'He lies like an epitaph;' and the French, 'Menteur comme une epitaphe.' Labbe has made a good collection in French, entitled Tresor des Epitaphes: Camden, Weaver, and several others have selected our English epitaphs; the Elegant Extracts of Dr. Knox, also contain abundance.

Epitaph is also applied to certain eloges, either in prose or verse, composed without any intent to be engraven on tombs; as that of Alexander,

Sufficit huic tumulus, cui non sufficeret orbis;

and that of Newton,

Isaacum Newton,
Quem immortalem
Testantur Tempus, Natura, Cœlum;
Mortalem hoc marmor
Fatetur.

EPITASIS, in ancient poetry, the second part of a dramatic poem, wherein the plot, entered upon in the protasis, or first part, was carried on, heightened, and worked up, till it arrived at its full height, called catastasis.

EPITASIS, in medicine, the increase of a disease or beginning of a paroxysm, particularly in a fever.

EPITHALA'MIUM, *n. s.* Επὶ and θαλαμος, a couch, or bed: a nuptial song; a compliment upon marriage.

I presume to invite you to these sacred nuptials: the *epithalamium* sung by a crowned muse. *Sandys.*

The forty-fifth psalm is an *epithalamium* to Christ and the church, or to the lamb and his spouse. *Burnet.*

*The* EPITHALAMIUM, among the Jews, was sung at the door of the bride, by her friends and companions, the evening before the marriage. Among the Greeks it was sung as soon as the married couple were going to bed, and attended with shouts and stamping of the feet. They returned in the morning, and, with the same song a little altered, saluted them again. The evening songs were called *επιθαλαμια κοιμητικα*; the morning salutes *επιθαλαμια εγερτικα*. This was the practice amongst the Romans also.

E'PITHEM, *n. s.* Gr. *ἐπιθημα*. A liquid medicament externally applied.

*Epithems*, or cordial applications, are justly applied unto the left breast. *Browne's Vulgar Errours.*

Cordials and *epithems* are also necessary, to resist the putrefaction, and strengthen the vitals. *Wiseman.*

*An* EPITHEM in pharmacy, is a remedy of a spirituous or aromatic kind, applied externally to the regions of the heart, liver, &c., to strengthen and comfort, or correct some intemperature of the part.

E'PITHET, *n. s.* Fr. *epithete*; Ital. Span. and Port. *epiteto*; Gr. *επιθετον*, *επι* and *τιθημι*, to place. An adjective denoting any quality good or bad: as, the verdant grove, craggy mountain, &c. Hence a title or name.

For which of my good parts did you first suffer love for me?——

Suffer love! a good *epithet*: I do suffer love indeed; for I love thee against my will. *Shakspeare.*

There seldom occurs a hard laboured expression, or a redundant *epithet*; all his verses exemplify his own definition of a good style; they consist of proper words in proper places. *Delany.*

I affirm with phlegm, leaving the *epithets* of false, scandalous, and villanous to the author. *Swift.*

The *epithet* of shades belonged more properly to the darkness than the refreshment. *Decay of Piety.*

EPITHETS, in poetry and rhetoric, are often annexed to substantives by way of ornament, not to make up an essential part of the description. Nothing, says Aristotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is so essential in poetry as a proper use of them. See POETRY.

EPIT'OME, *n. s.* ⎫ Old Fr. *epitome*; Ital.
EPIT'OMISE, *v. a.* ⎬ Span. Port. and Lat. *epi-*
EPIT'OMISER, *n. s.* ⎭ *tome*, *epitoma*; Gr. *επιτομη*, *επι* and *τεμνω*, to cut off. Abridgement; abbreviature; compendious abstract: to epitomise, from the noun, is to abridge; abstract: epitomiser, or epitomist, he who abstracts or abridges.

This is a poor *epitome* of yours,
Which, by the interpretation of full time,
May shew like all yourself.
*Shakspeare. Coriolanus.*

Who did the whole world's soul contract, and drove
Into the glasses of your eyes;
So made such mirrours and such spies,
That they did all to you *epitomise*. *Donne.*

*Epitomes* are helpful to the memory, and of good private use; but set forth for publick monuments, accuse the industrious writers of delivering much impertinency. *Wotton.*

When that *epitomizer* of Trogus had to the full described and set out king Ptolemy's riot, as a chief engine and instrument of his overthrow, he adds fiddling and dancing. *Burton.*

Both this Brennus, and another famous captain Britomarus, whom the *epitomist* Florus and others mention. *Milton.*

It would be well, if there were a short and plain *epitome* made, containing the most material heads. *Locke.*

Such abstracts and *epitomes* may be reviewed in their proper places. *Watts's Improvement of the Mind.*

If the ladies take a liking to such a diminutive race, we should see mankind *epitomized*, and the whole species in miniature. *Addison.*

We have *epitomized* many particular words, to the detriment of our tongue. *Id. Spectator.*

EPITRITUS, in prosody, a foot consisting of three long and one short syllable. Of these, grammarians reckon four kinds: the first consisting of an iambus and spondæus, as sălūtāntēs; the second of a trochæus and spondæus, as cōncĭtātī; the third of a spondæus and an iambus, as cōmmūnĭcāns; and the fourth of a spondæus and trochæus, as īncāntārĕ.

EPITROPE, in rhetoric, a species of concession; one of the figures of sentences, which grants one thing to obtain another more advantageous. It is either real or feigned; and either the whole of a thing, or only a part is granted. Of the use of this figure we have examples in Cicero's defence of Ligarius, who was accused by Tubero for having joined with Pompey in the civil war between him and Cæsar, cap. 1; and in the affair of Roscius, where the proof depended upon circumstances; and when Cicero, who defended him, enquires what reason could be alleged for his committing so black a crime, as to kill his father cap. 27. Cicero has also given us an example of a feigned or ironical concession in his defence of Flaccus, cap. 38; when interceding for him on account of his former good services, in the time of Catiline's conspiracy, he says in the way of irony, if such things are to be overlooked, 'let us appease the ghosts of Lentulus and Cethegus; let us recall those who are in exile, and let us be punished for our too great affection and love for our country.' To these feigned concessions we may refer such modes of reasoning, by which the orator both justifies a charge brought against him, upon the supposition of its being true; and also proves that the charge itself is false. Thus Cicero, in his defence of Milo, represents the taking off of Clodius, with which Milo was accused, as a glorious action; after he has shown

that Milo's servants did it without the knowledge of their master. Cap. 10 and 27.

EPITROPUS, a kind of arbitrator, whom the Greek Christians under the Turks elect to terminate their differences, and avoid carrying them before the Turkish magistrates. Anciently the Greeks used the term επιτροπος in the same sense as the Latins did procurator, viz. for a commissioner or intendant. Thus the commissioners of provisions in the Persian army are called by Herodotus and Xenophon epitropi. In the New Testament επιτροπος denotes the steward of a houshold, rendered in the vulgate procurator.

EPIZEUXIS, in rhetoric, a figure wherein the same word is repeated with vehemence in the same sense, without any other intervening, and suited to express anger, surprise, sorrow, &c.: thus age, age; adeste, adeste; and that of Virgil, Nunc, nunc insurgite remis, are instances of it. Thus also, when Cicero would express his indignation against Antony for having been the chief instrument in bringing on the civil war; he says to him: 'You, you, Antony, pushed Cæsar upon the civil war.' (Philip. ii. c. 22). Thus he tells Catiline in his first invective against him: 'You live, and live, not to lay aside, but to pursue, your wicked design.' (Ibid. cap. 2). See also Matthew xxiii. 37. The use of this figure shows the earnestness of the speaker, and the great concern of his mind about what he says.

E'POCH, *n. s.* } Ital. Span. and Port. *epo-*
E'POCHA, } *cha, epoca;* Lat. *epocha;* Gr. εποχη. The time at which a new computation is begun; the time from which dates are numbered.

Moses distinctly computes by certain intervals, memorable æras and *epochas*, or terms of time. *Browne.*

Some lazy ages, lost in sleep and ease,
No action leave to busy chronicles:
Such whose supine felicity but makes
In story chasms, in *epochas* mistakes. *Dryden.*

Their several *epochas* or beginnings, as from the creation of the world, from the flood, from the first olympiad, from the building of Rome, or from any remarkable passage or accident, give us a pleasant prospect into the histories of antiquity and of former ages. *Holder on Time.*

Time is always reckoned from some known parts of this sensible world, and from some certain *epochs* marked out to us by the motions observable in it. *Locke.*

These are the practices of the world, since the year sixty; the grand *epoch* of falsehood as well as debauchery. *South.*

Time, by necessity compelled, shall go
Through scenes of war, and *epochas* of woe. *Prior.*

For their farther improvement, and a little to vary their studies, let them now begin to read history, after having got by heart a short table of the principal *epochas* in chronology. *Franklin.*

E'PODE, *n. s.* Fr. *epode;* Gr. επωδος. The stanza following the strophe and antistrophe.

Strophe, antistrophe, or *epode*, were a kind of stanzas framed only for the musick. *Milton.*

The EPODE is said to have been the invention of Archilochus, and was anciently sung by the priests, standing still before the altar, after all the turns and returns of the strophe and antistrophe, and was not confined to any precise number or kind of verses. The epode is now a general name for all kinds of little verses that follow one or more great ones, of what kind soever they be: and in this sense, a pentameter is an epode after an hexameter. And as every little verse, which, being put after another, closes the period, is called epode; hence the sixth book of Horace's odes is entitled Liber Epodon, a book of epodes, because the verses are alternately long and short, and the short ones generally, though not always, close the sense of the long one.

EPONA, in mythology, a goddess mentioned in some ancient inscriptions, concerning whose name and offices antiquarians differ. Some think that she derived her name from a city called Epona. Keysler supposes, that her name was derived from ιππος, a horse, and that she was worshipped as the protectress of these animals.

EPOPE'E, *n. s.* Εποποι. An epic or heroic poem.

Tragedy borrows from the *epopee*, and that which borrows is of less dignity, because it has not of its own. *Dryden's Virgil.*

EPPING, a market town, in the county of Essex, formerly a hamlet of Waltham Abbey, and long noted for its forest or royal chase, formerly called the Forest of Essex, but now generally known by the name of Epping Forest, which reaches to within five miles of the metropolis. The provision market is held on Friday, and the cattle market on Thursday. It lies seventeen miles N. N. E. of London, and is noted for excellent butter made in its neighbourhood.

EPPING, a township of the United States, in Rockingham county, New Hampshire, taken from the north-west part of Exeter, and incorporated in 1741. It lies six miles north-west of Exeter, and twenty-three west of Portsmouth.

EPPINGEN, a town of Germany, in the late palatinate of the Rhine, on the Elfatz, ten miles west of Heilborn, and eighteen S. S. E. of Heidelberg.

EPROUVETTE, is a French machine, of which there are several varieties, used for proving the strength of gunpowder. The principle of this invention, in whatever form it may be applied, is to ascertain how far a certain measure or weight of gunpowder is capable of overcoming the resistance either of a certain weight, or of a spring, whose pressure against the explosion is computed. The former is evidently the most regular, and, consequently, the best adapted to military purposes, wherein the strength of the powder is often of the greatest moment, not only on account of the advantages gained by the greatest concentration of force, but because in the mortar and howitzer practice it is necessary to have a very accurate knowledge of the powers of expansion in the powder when ignited; by which means shells may be thrown, with the greatest precision, to any intended distance; whence the explosion takes the greatest possible effect.

In our arsenals, an eight-inch mortar is ordinarily employed as an eprouvette; being charged with two ounces of powder, and an iron ball of sixty-four pounds, the latter should be projected at least 150 feet; the elevation of the piece being 45°, and the bed being placed perfectly hori-

zontal. We consider this to be a fair standard; though some powder made from the best materials, and fresh from the mill, will sometimes exceed even 180 feet; while, on the other hand, weak powder, that is, such as has not been kept very dry, or that has been re-stored, will rarely make a range equal to 120, and generally not exceeding even 110 feet.

The above mode of proof relates to cannon-powder; that intended for the use of musketry is ascertained by an eprouvette of a different description; namely, a musket barrel, of which the interior is highly polished. This should, with a charge of only four drachms, impel a steel ball through fifteen wet elm boards, each a quarter of an inch in thickness, and placed at three quarters of an inch asunder; the first being thirty-nine feet and ten inches distant from the muzzle of the barrel. We must confess this exact number of inches in the distance, appears to be more fastidious than necessary, for we are apt to believe, that in experiments of this nature, the odd two inches, necessary to complete the fortieth foot, would by no means derange the process.

The French eprouvette for cannon-powder comes very close to our's, they using a brass ball of sixty pounds (French weight) whose diameter is seven inches and nine points, or three quarters of a line (French measure), with one line of windage (or space between the shot and the sides of the bore). The chamber holds precisely three ounces; which quantity of their best powder will throw the ball full 180 yards; their re-stored powder throwing it about 160 yards. But Mons. Lombard's experiments give a result of 250 yards, with the powder now manufactured at the French mills; the eprouvette being always elevated to 45°.

EPSOM, a village of Surrey, about eighteen miles south-west of London, long famous for its mineral waters. These were discovered in 1618; and are not yet impaired in virtue. When evaporated to dryness, the waters of this spring yield a residuum of which about five-sixths is sulphate of magnesia with a little muriate of lime and magnesia occasionally mixed; but there is nothing sulphurous or metallic ever found in this spring.

The Epsom salts were formerly obtained by boiling down the waters of this spring; but they are now procured entirely from sea water, which, after being boiled and the muriate of soda separated, deposit numerous crystals, consisting chiefly of the sulphate of magnesia, and which are sold under the name of 'salts,' or 'Epsom salts.' On the downs, near the village, are annually horse races; but the inns and bowling-greens are not so much frequented as formerly. In Hudson's Lane was Epsom Court, an ancient Saxon seat, long ago converted into a farm.

EPSOM, a township of the United States, in Rockingham county, New Hampshire, east of Pembroke; incorporated in 1727. It is ten miles east of Concord, and forty-five north-west of Portsmouth.

EPULATION, *n. s.* Lat. *epulatio.* Banquet; feast.

Contented with bread and water, when he would dine with Jove, and pretended to *epulation*, he desired no other addition than a piece of cheese.

*Browne's Vulgar Errours.*

EPULIS, from επι, upon, and ουλα, the gums, in surgery, a tubercle on the gums. There are two kinds; one of a benign nature and free from pain; the other more malignant, being very troublesome, and occasionally becoming, according to the descriptions of surgical writers, of a cancerous quality. Some of the excrescences are represented as having a narrow pedicle, while others are connected with the gum by means of a broad base. The best plan of treatment consists in extirpating an epulis, as soon as the nature of the case manifests itself. The object may be accomplished either with caustic, or the knife. The latter mode is that to which we should generally give the preference, because attended with the greatest degree of certainty, and not more pain.

Some writers advise us to tie the excrescence, when its neck is narrow. However, in such a case, the knife, or a pair of scissars, might also be very conveniently employed.

EPULO, in antiquity, a minister of sacrifice among the Romans. The pontifices, not being able to attend all the sacrifices performed at Rome to so many gods as were adored by that people, appointed three ministers, whom they called epulones, because they conferred on them the care and management of the epula, feasts in the solemn games and festivals. To them belonged the ordering and serving the sacred banquet, offered on such occasions to Jupiter, &c. They wore a gown bordered with purple like the pontifices. Their number was augmented from three to seven, and afterwards by Cæsar to ten. Their first establishment was in A.U.C. 558, under the consulate of L. Furius Purpureo, and M. Claudius Marcellus.

EPULOTIC, *n. s.* Επουλωτικος. A cicatrising medicament.

The ulcer, incarned with common sarcoticks, and the ulcerations about it, were cured by ointment of tutty, and such like *epuloticks.*

*Wiseman on Inflammation.*

EPULUM, in antiquity, a holy feast prepared for the gods in times of public danger. The feast was sumptuous, and the gods were formally invited and attended; for the statues were brought on rich beds furnished with soft pillows, called pulvinaria. Thus accommodated, their godships were placed on the most honorable part of their couches. The care of the epula belonged to the epulones, and the gods were plentifully served with the richest dainties, as if they had been able to eat! but the epulones performed that function for them, and doubtless were competent proxies. No wonder that Pliny solicited Trajan to be admitted of their order.

EPWORTH, a market town and parish of England, in the isle of Axholm, county of Lincoln. It is irregularly built, and has a manufacture of sacking and bagging. A weekly market and two annual fairs are held here. Population 1502. Eleven miles north of Gainsborough, and 159 north of London. Here were born Messrs. John and Charles Wesley, the celebrated founders of methodism.

E'QUABLE, *adj.* } Lat. *æquabilis.* Equal
E'QUABLY, *adv.* } to itself; even; uniform
EQUABIL'ITY, *n. s.* } in respect to form, motion, or temperament. Equability is uniformity; evenness of temper or condition.

He would have the vast body of a planet to be as elegant and round as a factitious globe represents it; to be every where smooth and *equable,* and as plain as the elysian fields. *Bentley.*

For the celestial bodies, the *equability* and constancy of their motions argue them ordained by Wisdom. *Ray.*

Nothing abates acrimony of the blood more than an *equable* motion of it, neither too swift nor too slow; for too quick a motion produceth an alkaline, and too slow an acid acrimony. *Arbuthnot.*

The *equability* of the temperature of the air rendered the Asiaticks lazy. *Id. on Air.*

If bodies move *equably* in concentrick circles, and the squares of their periodical times be as the cubes of their distances from the common centre, their centripetal forces will be reciprocally as the squares of the distances. *Cheyne.*

In his other works is found an *equable* tenour of easy language, which rather trickles than flows. *Johnson's Life of Swift.*

E'QUAL, *adj., n. s.,* & *v. a.* } Fr. *egal* (a
E'QUALIZE, *v. a.* } word used by
EQUALIZA'TION, *n. s.* } Chaucer and
EQUAL'ITY, } Sir T. More
E'QUALLY, *adv.* } for equal; see
E'QUALNESS, *n. s.* } the instance
below); Ital. *equale*; Span. *Ygual*; Port. *Igoal*; Lat. *æqualis.* Alike in quality, or quantity; adequate to: hence even, uniform, just, exact, impartial, equitable, indifferent. An equal is one neither superior nor inferior in station, excellence, or other qualities implied or expressed: to equal or equalise is to make a person or thing equal to some other; hence to reward, recompense fully; raise to a deserved rank or situation. Equalisation, equality, and equalness, signify the state of being alike.

If thou be among great men, make not thyself *equal* with them. *Eccles.*

I profited in the Jews' religion above many my *equals* in mine own nation. *Gal.* i. 14.

They made the married, orphans, widows, yea, and the aged also, *equal* in spoils with themselves. *Mac.*

He would make them all *equals* to the citizens of Rome. 2 *Mac.* ix. 15.

Richarde, the third sonne, of whom we nowe entreate, was in witte and courage *egall* with either of them. *Sir T. More.*

One whose all not *equals* Edward's moiety. *Shakspeare.*

That our stars unreconcileable should have divided
Our *equalness* to this. *Id.*

He is enamoured on Hero: I pray you, dissuade him from her; she is no *equal* for his birth. *Id. Much Ado About Nothing.*

We shall use them.
As we shall find their merits and our safety
May *equally* determine. *Id. King Lear.*

*Equality* of two domestick powers,
Breeds scrupulous faction. *Id. Antony and Cleopatra.*

In *equality* of conjectures, we are not to take hold of the worse; but rather to be glad we find any hope, that mankind is not grown monstrous. *Sir P. Sidney.*

It is a hard thing for a man, willingly and gladly to see his *equals* lifted over his head, in worth and opinion. *Bp. Hall's Contemplations.*

They had depressed Moses, God advances him: they had *equalled* themselves to Moses, God prefers him to them. *Id.*

That would make the moved body, remaining what it is, in regard of its bigness, to *equalise* and fit a thing bigger than it is. *Digby.*

The Scots trusted not their own numbers, as *equal* to fight with the English. *Clarendon.*

*Equal* lot
May join us; *equal* joy, as *equal* love. *Milton.*

One shall rise,
Of proud ambition; who, not content
With fair *equality,* fraternal state,
Will arrogate dominion undeserved
Over his brethren. *Id. Paradise Lost.*

To *equalise* accounts we will allow three hundred years, and so long a time as we can manifest from the Scripture. *Browne.*

Measure out the lives of men, and periodically define the alterations of their tempers, conceive a regularity in mutations, with an *equality* in constitutions, and forget that variety which physicians therein discover. *Id. Vulgar Errours.*

Although there were no man to take notice of it, every triangle would contain three angles *equal* to two right angles. *Hall.*

Ye lofty beeches, tell this matchless dame,
That if together ye fed all one flame,
It could not *equalise* the hundredth part
Of what her eyes have kindled in my heart. *Waller.*

Nor you, great queen, these offices repent,
Which he will *equal,* and perhaps augment. *Id.*

She sought Sicheus through the shady grove,
Who answered all her cares, and *equalled* all her love. *Dryden.*

Each to his proper fortune stand or fall,
*Equal* and unconcerned I look on all:
Rutilians, Trojans, are the same to me,
And both shall draw the lots their fates decree. *Id. Æneid.*

It is not permitted me to make my commendation *equal* to your merit. *Id. Fables. Dedication.*

Though I have said before, that all men by nature are *equal,* I cannot be supposed to understand all sorts of *equality*: age or virtue may give men a just precedency. *Locke.*

If the motion of the sun were as unequal as of a ship, sometimes slow, and at others swift; or, if being constantly *equally* swift, it yet was not circular, and produced not the same appearances, it would not help us to measure time more than the motion of a comet does. *Id.*

A little wit is *equally* capable of exposing a beauty, and of aggravating a fault; and though such a treatment of an author naturally produces indignation in the mind of an understanding reader, it has, however, its effect among the generality of those whose hands it falls into, the rabble of mankind being very apt to think that every thing which is laughed at, with any mixture of wit, is ridiculous in itself. *Addison.*

Those who were once his *equals,* envy and defame him, because they now see him their superior; and

those who were once his superiors, because they look upon him as their *equal*. *Id.*

To my dear *equal* in my native land,
My plighted vow I gave: I his received:
Each swore with truth, with pleasure each believed:
The mutual contract was to heaven conveyed.
*Prior.*

They who are not disposed to receive them, may let them alone, or reject them; it is *equal* to me.
*Cheyne's Phil. Prin.*

Think not of me: perhaps my *equal* mind
May learn to bear the fate the gods allot me.
*Smith.*

The covetous are *equally* impatient of their condition, *equally* tempted with the wages of unrighteousness, as if they were indeed poor. *Rogers.*

According to this *equality* wherein God hath placed all mankind, with relation to himself, in all the relations between man and man there is a mutual dependance. *Swift.*

I know no body so like to *equal* him, even at the age he wrote most of them as yourself.
*Trumbull to Pope.*

Mark by what wretched steps their glory grows;
From dirt and sea-weed as proud Venice rose:
In each how guilt and greatness *equal* ran,
And all that raised the hero sunk the man. *Pope.*

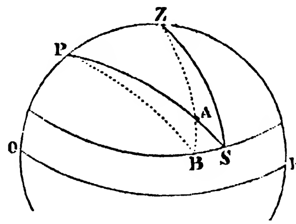
I trust in thee, and know in whom I trust:
Or life or death is *equal*; neither weighs;
All weight in this—O let me live to thee!
*Young.*

A man's genius is always, in the beginning of life, as much unknown to himself as to others; and it is only after frequent trials, attended with success, that he dares think himself *equal* to those undertakings in which those who have succeeded have fixed the admiration of mankind. *Hume.*

Two of those nearest *equal* in their spelling to be put together. Let these strive for victory; each propounding ten words every day to the other to be spelled. *Franklin.*

I have never conceived—that their ease, and their satisfaction, and their *equalization* with the rest of their fellow-subjects of Ireland, are things adverse to the principles of that connection. *Burke.*

EQUAL ALTITUDES, in astronomy, afford one of the most certain methods of determining time, and thus ascertaining the error of a clock or chronometer. For this purpose all that is necessary is to observe the instant the sun or star is at any altitude towards the east, before the meridian passage; and the instant must likewise be marked when the same object attains exactly the same altitude towards the west, after the meridian passage: the mean between the above quantities will be the instant marked by the clock at the moment the sun or star was on the meridian. The operation, however, supposes, that the declination of the object has not varied during the elapsed interval, but this with the sun seldom happens. The observation, therefore, must be corrected by a table, or by a direct calculation.




Let P in the diagram be the elevated pole, Z the zenith, S the sun, S B an arc parallel to the horizon H O, so that the points B and S have the same altitude; P S the polar distance of the sun in the morning, P B its polar distance in the evening (supposed to have become less). When the sun in the afternoon arrives at the point B, whose altitude suppose 20°, the same as the morning, the hour angle Z P B, or the distance of the sun, and its hour angle from the meridian P Z, will be greater than the morning hour angle Z P S. We have, therefore, two triangles, Z P S, Z P B, which have each the side P Z common, and the sides Z S, Z B, each equal to 70°, since they are the complements of the altitudes, 20° in each case. The sides P S, P B, differ by a quantity which is equal to the change of the sun's declination in the interval between the two observations. If the two triangles be resolved separately, the two hour angles will be found different: the half of this difference is the correction, which must be applied to the middle point of time to obtain the exact instant of the sun's passage over the meridian. This correction is given in the annexed table, which is taken from the last edition of Lalande's Astronomy. It is calculated from the following differential analogy.

$$\frac{\delta x}{30}\left(\frac{\text{tang. latitude}}{\text{sin. hour-angle}} \mp \frac{\text{tang. dec. } \odot}{\text{tang. hour-angle}}\right)$$

## CORRECTION TABLE OF EQUAL ALTITUDES, FROM LALANDE'S ASTRONOMY

Argument half the elapsed time.

| Sun's Long. S. D. | h. m. 1 40 | h. m. 2 0 | h. m. 2 20 | h. m. 2 40 | h. m. 3 0 | h. m. 3 20 | h. m. 3 40 | h. m. 4 0 |
|---|---|---|---|---|---|---|---|---|
| 0 0 | 15·58 | 15·80 | 16·07 | 16·39 | 16·76 | 17·19 | 17.68 | 18·24 |
| Sub.10 | 15·28 | 15·50 | 15·76 | 16·08 | 16·44 | 16·86 | 17·35 | 17·90 |
| 20 | 14·60 | 14·81 | 15·06 | 15·36 | 15·71 | 16·11 | 16·57 | 17·10 |
| I. 0 | 13·52 | 13·72 | 13·95 | 14·23 | 14·55 | 14·92 | 15·35 | 15·84 |
| Sub.10 | 12·06 | 11·24 | 12·44 | 12·69 | 12·98 | 13·31 | 13·69 | 14·13 |
| 20 | 10·22 | 10·37 | 10·55 | 10·76 | 11·00 | 11·28 | 11·61 | 11·98 |
| II. 0 | 8·04 | 8·15 | 8·29 | 8·45 | 8·65 | 8·87 | 9·12 | 9·41 |
| Sub.10 | 5·55 | 5·62 | 5·72 | 5·83 | 5·97 | 6·12 | 6·29 | 6·50 |
| 20 | 2·83 | 2·87 | 2·92 | 2·98 | 3·05 | 3·12 | 3·22 | 3·32 |
| III. 0 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 |
| Add10 | 2·83 | 2·87 | 2·92 | 2·97 | 3·04 | 3·12 | 3·21 | 3·31 |
| 20 | 5·52 | 5·60 | 5·70 | 5·81 | 5·94 | 6 10 | 6·27 | 6·47 |
| IV. 0 | 7·99 | 8·11 | 8·24 | 8·4! | 8·60 | 8·82 | 9·07 | 9·36 |
| Add10 | 10·15 | 10·30 | 10·47 | 10·68 | 10·92 | 11·20 | 11·52 | 11·89 |
| 20 | 11·96 | 12·13 | 12·34 | 12·58 | 12·87 | 13·20 | 13·68 | 14·01 |
| V. 0 | 13·39 | 13·59 | 13·82 | 14·09 | 14·41 | 14·78 | 15·20 | 15·69 |
| Add10 | 14·45 | 14·65 | 14·92 | 15·20 | 15·54 | 15·94 | 16·40 | 16·92 |
| 20 | 15·12 | 15·33 | 15·59 | 15·90 | 16·26 | 16·68 | 17·16 | 17·70 |
| VI. 0 | 15·40 | 15·62 | 15·89 | 16·20 | 16·57 | 16·99 | 17·48 | 18·04 |
| Add10 | 15·29 | 15·51 | 15·77 | 16·09 | 16 45 | 16·87 | 17·36 | 17·91 |
| 20 | 14·78 | 14·99 | 15·25 | 15·55 | 15·90 | 16·31 | 16·78 | 17·31 |
| VII. 0 | 13·85 | 14·04 | 14 28 | 14·57 | 14·90 | 15·28 | 15·72 | 16·22 |
| Add10 | 12·48 | 12·66 | 12·88 | 13·13 | 13·43 | 13·77 | 14·17 | 14·62 |
| 20 | 10·68 | 10·83 | 11·02 | 11·24 | 11·49 | 11·79 | 12·13 | 12·51 |
| VIII. 0 | 8·46 | 8·59 | 8·73 | 8·90 | 9·11 | 9·34 | 9·61 | 9·91 |
| Add10 | 5·88 | 5·96 | 6·07 | 6·19 | 6·33 | 6·49 | 6·67 | 6·89 |
| 20 | 3·02 | 3·06 | 3·11 | 3·17 | 3·25 | 3·33 | 3·42 | 3·53 |
| IX. 0 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 |
| Sub.10 | 3·02 | 3·06 | 3·12 | 3·18 | 3·25 | 3·33 | 3·43 | 3·54 |
| 20 | 5·90 | 5·99 | 6·09 | 6·21 | 6·35 | 6·51 | 6·70 | 6·91 |
| X. 0 | 8·51 | 8·63 | 8·78 | 8·95 | 9·16 | 9·39 | 9·66 | 9·97 |
| Sub.10 | 10·76 | 10·91 | 11·10 | 11·32 | 11·57 | 11·87 | 12·21 | 12·60 |
| 20 | 12·59 | 12·77 | 12·99 | 13·24 | 13·54 | 13·89 | 14·29 | 14·74 |
| XI. 0 | 13·98 | 14·18 | 14·42 | 14·71 | 15·04 | 15·42 | 15·87 | 16·37 |
| Sub.10 | 14·93 | 15·14 | 15·40 | 15·71 | 16·06 | 16·47 | 16·95 | 17·49 |
| 20 | 15·42 | 15·64 | 15·91 | 16·22 | 16·59 | 17·02 | 17·51 | 18·06 |

| Sun's Long. | h.m. 1 40 | h.m. 2 0 | h.m. 2 20 | h.m. 2 40 | h.m. 3 0 | h.m. 3 20 | 3 40 | h.m. 4 0 | Log. of Diurn. Mot. in Declin. |
|---|---|---|---|---|---|---|---|---|---|
| ). 0 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 3·1529 |
| Add10 | 0·96 | 0·93 | 0·90 | 0·85 | 0·81 | 0·75 | 0·69 | 0·62 | 3·1445 |
| 20 | 1·82 | 1·76 | 1·70 | 1·62 | 1·53 | 1 42 | 1·31 | 1·18 | 3·1247 |
| 0 | 2·49 | 2·41 | 2·32 | 2·21 | 2·09 | 1·95 | 1·79 | 1·61 | 3·0915 |
| Add10 | 2·90 | 2·81 | 2·70 | 2·57 | 2·43 | 2·27 | 2·08 | 1 87 | 3·0419 |
| 20 | 2·97 | 2·88 | 2·77 | 2·64 | 2·49 | 2·32 | 2·13 | 1·92 | 2·9701 |
| I. 0 | 2·68 | 2·59 | 2·49 | 2·38 | 2 25 | 2·09 | 1·92 | 1·73 | 2·8655 |
| Add10 | 2 03 | 1·97 | 1·89 | 1·80 | 1·70 | 1·59 | 1 46 | 1·31 | 2·7044 |
| 20 | 1·09 | 1·06 | 1·02 | 0·97 | 0·92 | 0·86 | 0·79 | 0·71 | 2·4124 |
| II. 0 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0 00 | 0·00 | 0 00 | |
| ib.10 | 1·09 | 1·06 | 1·02 | 0·97 | 0·92 | 0·85 | 0·78 | 0·71 | 2·4116 |
| 20 | 2·03 | 1·96 | 1·88 | 1·80 | 1·70 | 1·58 | 1·45 | 1·31 | 2·7027 |
| V. 0 | 2·66 | 2 58 | 2·48 | 2·37 | 2·23 | 2·80 | 1·91 | 1·72 | 2·8630 |
| Sub.10 | 2·95 | 2·86 | 2·75 | 2·62 | 2·47 | 2·31 | 2·12 | 1·90 | 2·9669 |
| 20 | 2·87 | 2·78 | 2·68 | 2·55 | 2·41 | 2·25 | 2·06 | 1·86 | 3·0381 |
| V. 0 | 2·46 | 2·39 | 2·30 | 2·19 | 2·07 | 1·93 | 1·77 | 1·59 | 3·0873 |
| Sub.10 | 1·80 | 1·74 | 1·68 | 1·60 | 1·51 | 1·41 | 1·29 | 1·66 | 3·1201 |
| 20 | 0·95 | 0·92 | 0·89 | 0·85 | 0·80 | 0 74 | 0·68 | 0·61 | 3·1398 |
| VI. 0 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | 3·1479 |
| Add10 | 0·96 | 0·93 | 0·90 | 0·85 | 0·81 | 0·75 | 0·69 | 0 62 | 3·1449 |
| 20 | 1·84 | 0·78 | 1·72 | 1·64 | 0 95 | 1·44 | 0·33 | 1·20 | 3·1330 |
| VII. 0 | 3·55 | 2·47 | 2 38 | 2·27 | 2·14 | 2·00 | 1·83 | 1·65 | 3·1017 |
| Add10 | 3·00 | 2.90 | 2·79 | 2 66 | 2·51 | 2·34 | 2·15 | 1·94 | 3 0567 |
| 20 | 3·10 | 3·01 | 2·89 | 2·76 | 2 60 | 2 43 | 2·23 | 2·00 | 2·9890 |
| VIII. 0 | 2·82 | 2·73 | 2·62 | 2·51 | 2·37 | 2·21 | 2·02 | 1·82 | 2·8880 |
| Add10 | 2·15 | 2·08 | 2·01 | 1·91 | 1·80 | 1·68 | 1·54 | 1·39 | 2.7297 |
| 20 | 1·17 | 1·13 | 1·09 | 1·04 | 0 98 | 0·91 | 0·84 | 0·75 | 2·4399 |
| IX. 0 | 0·00 | 0·00 | 0 00 | 0·00 | 0·00 | 0·00 | 0·00 | 0·00 | |
| Sub.10 | 1·17 | 1·13 | 1·09 | 1·04 | 0·98 | 0 91 | 0·84 | 0·75 | 2·4406 |
| 20 | 2·15 | 2·09 | 2·01 | 1·92 | 1·81 | 1·69 | 1·55 | 1·39 | 2·7314 |
| X. 0 | 2·83 | 2·75 | 2·64 | 2 52 | 2·38 | 2·22 | 2·04 | 1·83 | 2·8903 |
| Sub.10 | 3·12 | 3·03 | 2·91 | 2·78 | 2·62 | 2·44 | 2·24 | 2·02 | 2·9921 |
| 20 | 3·02 | 2·93 | 2·88 | 2·69 | 2·54 | 2·36 | 2·17 | 1·95 | 3·0603 |
| XI. 0 | 2·57 | 2·49 | 2·40 | 2·29 | 2·16 | 2·01 | 1·85 | 1·66 | 3·1059 |
| Sub.10 | 1·86 | 1·80 | 1·73 | 1·65 | 1·56 | 1·46 | 1·34 | 1·20 | 3·1345 |
| 20 | 0·97 | 0·94 | 0·90 | 0·86 | 0·81 | 0·76 | 0·70 | 1·63 | 3·1486 |

*** Multiply the tangent by the latitude, and if it is south, change the signs.

Equal Beating, in music, is applied to such tempered concords as beat equally quick, or make the same number of wa, wa, wa, wa's, in a given space of time, when sounding. The first who mentions, or makes any use of equal beating concords, is Dr. Robert Smith, who observes, (Harmonics, p. 188), 'if several imperfect consonances of the same name, as fifths, for instance (by which the whole scale is usually tuned), beat equally quick, they are not equally harmonious, or tempered; to make them so, the higher in the scale ought to beat as much quicker than the lower, as their bases vibrate quicker; that is, if a fifth be a minor tone higher than another, it should beat quicker, in the ratio of 10 to 9, or (if a major tone) 9 to 8 nearly; if a third higher, in the ratio of 5 to 4; if a fifth higher, in the ratio of 3 to 2; if an eighth higher, of 2 to 1, &c.

EQUANIMITY, *n. s.* } Lat. *æquanimitas.*
Equa'nimous, *adj.* } Evenness of mind, neither elated nor depressed.

I do not know how to express this habit of mind, except you will let me call it *equanimity*. It is a virtue which is necessary at every hour, in every place,

and in all conversations; and is the effect of a regular and exact prudence. *Tatler.*

Not so the idle muses' mad-cap train,
Not such the working of their moon-struck brain;
In *equanimity* they never dwell,
By turns in soaring heaven, or vaulted hell.
*Burns.*

EQUATION, *n. s.* Lat. *æquare.* The investigation of a mean proportion collected from the extremities of excess and defect, to be applied to the whole.

We are to find out the extremities on both sides, and from and between them the middle daily motions of the sun along the ecliptick; and to frame tables of *equation* of natural days, to be applied to the mean motion by addition or subtraction, as the case shall require. *Holder on Time.*

By an argument taken from the *equations* of the times of the eclipses of Jupiter's satellites, it seems that light is propagated in time, spending in its passage from the sun to us about seven minutes of time. *Newton's Opticks.*

EQUATION ALGEBRAIC. See ALGEBRA.
EQUATION OF THE CENTRE. See ASTRONOMY.
EQUATION OF PAYMENTS. See ARITHMETIC.
EQUATION OF TIME. See ASTRONOMY.

EQUATOR, *n. s.* } Lat. *æquator.* A great
EQUATO'RIAL, *adj.* } circle of the earth, whose poles are those of the world. See below.

By reason of the convexity of the earth, the eye of man, under the *equator*, cannot discover both the poles; neither would the eye, under the poles, discover the sun in the *equator*. *Browne's Vulgar Errours.*

On the other side the *equator*, there is much land still remaining undiscovered. *Ray on the Creation.*

The planets have spheroidical figures, and obliquities of their *equatorial* to their ecliptic planes. *Cheyne.*

Rocks rich in gems, and mountains big with mines,
That on the high *equator* ridgy rise,
Whence many a bursting stream auriferous plays.
*Thomson.*

The expansive force of steam was known in some degree to the ancients: Hero of Alexandria describes an application of it to produce a rotative motion by the re-action of steam issuing from a sphere mounted upon an axis, through two small tubes bent into tangents, and issuing from the opposite sides of the *equatorial* diameter of the sphere. *Darwin.*

EQUATOR. See ASTRONOMY, and GEOGRAPHY.

EQUATOR, CROSSING THE. When a vessel in her voyage crosses this line it has been a custom, time immemorial, to perform a certain ceremony on those of the crew who have not previously passed through it, in order to make them *free of the line.* Two persons are selected by the officers to preside over this ceremony, who take the characters of Neptune and his wife Amphitrite, and with tridents, conch shells, &c., head their gang. They first order the largest tubs in the ship to be brought upon deck and filled with salt water; across each tub a spar or hand-spike is placed as a seat, on which the candidates for freedom are set, whilst they are lathered with a composition of tar, grease, &c., and shaved with a piece of old iron hoop, the edge of which is well notched. This being done, each person attempts to rise from his hazardous seat, when it is generally so contrived that he falls heels over head into the tub of water; and, after having gone through this ceremony, he becomes free of the equator.

EQUATORIAL SECTOR. See ASTRONOMY.

EQUERRY, or EQUERY, an officer of the king's stables, under the master of the horse. Of these there are seven, who, when his majesty goes abroad, ride in the leading coach, are in waiting one at a time monthly, and have a table with the gentlemen ushers during the time, and a salary of £300 a year each. They used to ride on horseback by the coach side, when the king travelled; but that, being more expensive to them than necessary to the sovereign, has beeen discontinued.

EQUERRY OF THE CROWN STABLE has that appellation as being employed in managing and breaking the saddle horses, and preparing them for the king's riding. There are two of these; The first has an annual salary of £256, and the second of £200. One is, or always should be, in close waiting at court; and, when his majesty is going to ride, holds the stirrup, while the master of the horse, or one of the equerries in his absence, assists in mounting him; and, when his majesty rides, they usually attend him.

EQUERY, or ECURY; French escuire, or Latin equile, a stable, from equus, a horse; a grand stable for horses, furnished with stalls, manger, rack, &c. Some think the word stable properly relates only to bullocks, cows, sheep, hogs, &c.; and equery to horses, mules, &c. A simple equery is that provided for one row of horses; a double equery that provided for two, with a passage in the middle, or two passages; the horses being placed head to head, as in the equery at Versailles. Under equery are sometimes, also, comprehended the lodgings and apartments of the equerries, grooms, pages, &c.

EQUES; from equus, a horse; in antiquity, a knight or horseman. See EQUESTRIAN ORDER and EQUITES.

EQUES AURATUS, a knight bachelor; called auratus, that is gilt, because anciently none but knights might gild or beautify their armour with gold. In law this term is not used; but, instead of it, miles, and sometimes chevalier.

EQUESTRIAN, *adj.* Lat. *equestris.* Being on horseback: skilled in horsemanship.

An *equestrian* lady appeared upon the plains. *Spectator.*

EQUESTRIAN GAMES, among the ancient Romans, horse-races, of which there were five kinds: the prodromus, or plain horse-race; the chariot race; the decursory race, round funeral piles; the ludi severales; and the ludi Neptunales.

EQUESTRIAN ORDER, among the Romans, signified their equites or knights: also their horsemen in the field; the first of which orders stood in contradistinction to the senators; as the last did to the foot, military, or infantry. Each of these distinctions was introduced into the state by Romulus.

EQUICRU'RAL, *adj.* } Lat. *æquus* and
EQUICRU'RE. } *crus*, the leg. Having the legs of an equal length, and longer than the base; isosceles.

An *equicrure* triangle goes upon a certain proportion of length and breadth. *Digby on the Soul.*

We successively draw lines from angle to angle until seven *equicrural* triangles be described. *Browne.*

EQUIDIS'TANCE, *n. s.* } Lat. *æquus* and
EQUIDIS'TANT, *adj.* } *distantia*, distance.
EQUIDIS'TANTLY, *adv.* } Equal distance or remoteness.

Into our reason flow, and there do end,
All that this natural world doth comprehend;
Quotidian things, and *equidistant* hence,
Shut in for man in one circumference. *Donne.*

The collateral *equidistance* of cousin-german from the stock whence both descend, hath in it no such appearance of inequality. *Bp. Hall.*

The liver, seated on the right side, by the subclavian division *equidistantly* communicates unto either arm. *Brown.*

The fixt stars are not all placed in the same concave superficies, and *equidistant* from us, as they seem to be. *Ray.*

From the *equidistance* of the letters and vowel, they gather the distinction of the persons. *Lightfoot.*

EQUIFORM'ITY, *n. s.* Lat. *æquus* and *forma*, uniform equality.

No diversity or difference, but a simplicity of parts and *equiformity* of motion. *Browne's Vulgar Errours.*

EQUILA'TERAL, *adj.* Lat. *equus* and *latus*, a side. Having all sides equal.

Circles or squares, or triangles *equilateral*, which are all figures of equal lines, can differ but in greater or lesser. *Bacon.*

Trifling futility appears in their twelve signs of the zodiack and their aspects: why no more aspects than diametrically opposite, and such as make *equilateral* figures? *Bentley.*

EQUILATERAL HYPERBOLA is that in which the conjugate axes, and every pair of conjugate diameters, are equal to each other. The asymptotes are also at right angles to each other, and each of them forms a right angle with the axis. Such an hyperbola is also equal to its opposite hyperbola, and likewise to its conjugate hyperbola, so that all the four conjugate hyperbolas are mutually equal to each other. Hence, as the parameter is a third proportional to the conjugate axes, they are all mutually equal; consequently, if in the equation for the hyperbola $y^2 = \frac{p}{t} \times \overline{tx+x^2}$, or $= \frac{c^2}{t^2} \times \overline{tx+x^2}$, in which $t$ is the transverse axis, $c$ the conjugate, $p$ the parameter, $x$ the absciss, and $y$ the ordinate, $t$, $c$, and $p$ being made equal, the equation for the equilateral hyperbola becomes $y^2 = tx + x^2$; differing from that of the circle merely in the sign of the term $x^2$, which in the circle is $-$. See HYPERBOLA.

EQUILI'BRATE, *v. a.* } Lat. *equilibrium.*
EQUILIBRA'TION, *n. s.* } Equipoise; to ba-
EQUILIB'RIUM, } lance equally; to
EQUILIB'RIO, *abl. case.* } keep even with equal weight on each side.

The accession of bodies upon or secession thereof from the earth's centre, perturb not the *equilibration* of either hemisphere. *Browne's Vulgar Errours.*

In so great a variety of motions, as running, leaping, and dancing, nature's laws of *equilibration* are observed. *Derham.*

If the point of the knife, drawn over the loadstone, have in this affriction been drawn from the equator of the loadstone towards the pole, it will attract one of the extremes of an *equilibrated* magnetick needle. *Boyle's Experiments.*

Things are not left to an *equilibrium*, to hover under an indifference whether they shall come to pass, or not come to pass. *South.*

It is in *equilibrio*
If deities descend or no;
Then let the affirmative prevail
As requisite to form my tale. *Prior.*

Health consists in the *equilibrium* between those two powers, when the fluids move so equally that they don't press upon the solids with a greater force than they can bear. *Arbuthnot.*

The bodies of fishes are *equilibrated* with the water in which they swim. *Id. on Air.*

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang so exactly even and level, that neither ascends or descends, but both keep in a position parallel to the horizon; being both charged with an equal weight.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the same number or quantity. Hence equimultiples are always in the same ratio to each other as the simple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINE'CESSARY, *adj.* Lat. *æquus* and *necessarius*. Needful in the same degree.

For both to give blows and to carry,
In fights, are *equinecessary*. *Hudibras.*

EQUINOC'TIAL, *adj.* & *n. s.* } From equi-
EQUINOC'TIALLY, *adv.* } nox. Pertaining to the equinox; or occurring at the equinox: as a substantive, synonymous with equinox.

Natural tempests are greatest about the *equinoctial*. *Bacon.*

Thrice the *equinoctial* line
He circled; four times crossed the car of night
From pole to pole, traversing each colure. *Milton.*
Some say the sun
Was bid turn reins from the *equinoctial* road,
Like distant breadth. *Id. Paradise Lost.*

They may be refrigerated inclanately, or somewhat *equinoctially*; that is, towards the eastern and western points. *Browne.*

*The* EQUINOCTIAL or ÆQUINOCTIAL, in astronomy, is a great and immoveable circle of the sphere, under which the equator moves in its diurnal motion. It is ordinarily confounded with the equator; but there is a difference; the equator being moveable, and the equinoctial immoveable; and the equator being drawn about the convex surface of the sphere, but the equinoctial on the concave surface of the Great Globe. The shadows of those who live under this circle are cast to the southward of them for one half of the year, and to the northward during the other half; and twice in a year, viz. at the equinoxes, the sun at noon

casts no shadow, being in their zenith. See Equinox.

Equinoctial Points are the two points in which the equator and ecliptic intersect each other: the one, being in the first point of Aries, is called the vernal point or equinox; and the otner, in the first point of Libra, the autumnal point or equinox. The equinoctial points, and all the other points of the ecliptic, are continually moving backward, or in antecedentia, i. e. westward. This retrograde motion is called the precession of the equinoxes. See Astronomy.

E'QUINOX, *n. s.* Lat. *æquus* and *nox*, night. Equinoxes are the precise times in which the sun enters into the first point of Aries and Libra; for then, moving exactly under the equinoctial, he makes our days and nights equal. This he does twice a year, about the 21st of March and 23d of September, which therefore are called the vernal and autumnal equinoxes.

> Do but see his vice;
> 'Tis to his virtues a just *equinox*,
> The one as long as the other.
> *Shakspeare. Othello.*

It ariseth not heliacally about the autumnal *equinox*. *Browne.*

The time when this kid was taken out of the womb was about the vernal *equinox*. *Ray.*

> 'Twas now the month in which the world began,
> If March beheld the first created man;
> And since the vernal *equinox*, the sun,
> In Aries twelve degrees or more had run. *Dryden.*

> The passage yet was good; the wind, 'tis true,
> Was somewhat high, but that was nothing new,
> No more than usual *equinoxes* blew. *Id.*

Equinox, in astronomy, the time when the sun enters one of the equinoctial points. The equinoxes happen when the sun is in the equinoctial circle, of consequence the days are equal to the nights throughout the world, which is the case twice a year, viz. about the 21st of March, and the 22nd of September; the first of which is the vernal, and the second the autumnal equinox.

As the sun's motion is unequal, that is, sometimes swifter and sometimes slower (from causes explained under the article Astronomy), it comes to pass that there are about eight days more from the vernal to the autumnal equinox than from the autumnal to the vernal, the sun spending so much more time in travelling through the northern than the southern signs. According to the observations of Cassini, the sun is 186 d 14 h. 53 m. in the northern signs, and only 178 d. 14 h. 56 m. in the southern. The difference of which is 7 d. 23 h. 57 m.

The sun, continually advancing forwards in the ecliptic, and gaining a degree every day, makes no stay in the equinoctial points, but the moment he arrives in them he also leaves them. Of course, therefore, though the day the sun enters the equinoctial point is called the equinox, as being reputed equal to the night, yet it is not precisely so, unless the sun enter the equator at mid-day; for if the sun, at rising, should enter the vernal equinox, at setting he will have departed from it, and have got northwards about 12'; consequently that day will be somewhat longer than twelve hours, and the night proportionably shorter.

The time of the equinoxes, that is, the moment in which the sun enters the equator, is found by observation, the latitude of the place of observation being given. Thus, in the equinoctial day, or near it, take the just meridian altitude of the sun; if this be equal to the altitude of the equator, or the complement of the latitude, the sun is that very moment in the equator: if it be not equal, the difference is the sun's declination. The next day observe the meridian altitude as before, and find his declination; if the declination be of different kinds, viz. the one north and the other south, the equinox has happened in the interval of time between them; otherwise, the sun has not entered the equinoctial, or had passed it at first. From these observations a trigonometrical calculus gives the time of the equinox.

EQUINU'MERANT, *adj.* Lat *æquus* and *numerus*. Having the same number; consisting of the same number.

This talent of gold, though not *equinumerant*, nor yet equiponderant, as to any other; yet was equivalent to some correspondent talent in brass. *Arbuthnot on Coins.*

EQUIP,' *v. a.*
EQ'UIPAGE, *n. s.*
EQ'UIPAGED, *adj.*
EQUIP'MENT, *n. s.*
Fr. *equiper*; Old Fr. *equippe*, meaning a sailor, says Mr. Todd, 'derived perhaps from the barbarous Lat. *eschipare*, to furnish or adorn vessels.' Junius thus conjectures the French word to have been formed. Minsheu says, therefore, 'to dight, to set forth man, horse, or ship.' Equipage is the furniture of a horseman, &c., or the attendance, retinue of a traveller; accoutrement: equipment, the act of equipping, or the equipage.

> Soon as thy dreadful trump begins to sound,
> The god of war, with his fierce *equipage*
> Thou do'st awake, sle : he o sound.
> *Faerie Queene.*

> She forth issued with a goodly train
> Of squires and ladies *equipaged* well,
> And entertained them right fairly, as befell.
> *Spenser.*

> I will not lend thee a penny.——
> I will retort the sum in *equipage*.
> *Shakspeare.*

> Winged spirits, and chariots winged,
> From the armory of God; where stand of old
> Myriads, between two brazen mountains lodged
> Against a solemn day, harnessed at hand,
> Celestial *equipage*. *Milton's Paradise Lost.*

The country are led astray in following the town; and *equipped* in a ridiculous habit, when they fancy themselves in the height of the mode. *Addison.*

Extinguish vanity in the mind, and you naturally retrench the little superfluities of garniture and *equippage*. The blossoms will fall of themselves when the root that nourishes them is destroyed. *Steele.*

> Think what an *equipage* thou hast in air,
> And view with scorn two pages and a chair.
> *Pope.*

> Then over all, that he might be
> *Equipped* from top to toe,
> His long red cloak, well brushed and neat,
> He manfully did throw. *Cowper.*

Equipage, in military art, denotes all sorts of utensils, artillery, &c., necessary for commencing and prosecuting with ease and success any mili-

tary operations. Camp and field equipage consists of tents, kitchen furniture, saddle horses, baggage waggons, bat horses, &c.

EQUIPE'NDENCY, *n. s.* Lat. *æquus* and *pendeo.* The act of hanging in equipoise; not determined either way.

The will of man, in the state of innocence, had an entire freedom, a perfect *equipendency* and indifference to either part of the contradiction, to stand or not to stand. *South.*

E'QUIPOISE, *n. s.* Lat. *æquus* and Fr. *poids.* Equality of weight; equilibration; equality of force.

In the temperate zone of our life there are few bodies at such an *equipoise* of humours, but that the prevalency of some one indisposeth the spirits. *Glanville's Scepsis.*

EQUIPO'LLENCE, *n. s.* } Lat. *æquus* and
EQUIPO'LLENT, *adj.* } *pollentia.* Equality of force or power.

In his *equipollence* he judgeth him equivalent with God omnipotent. *Shelton.*

Votary resolution is made *equipollent* to custom, even in matter of blood. *Bacon's Essays.*

EQUIPO'NDERATE, *v.* } Lat. *æquus*
EQUIPO'NDERANCE, *n. s.* } and *pondero.*
EQUIPO'NDERANCY, } To weigh equal
EQUIPO'NDERANT, *adj.* } to any thing: being of the same weight.

Their lungs may serve to render their bodies *equiponderent* to the water. *Ray on the Creation.*

A column of air, of any given diameter; is *equiponderant* to a column of quicksilver of between twenty-nine and thirty inches height. *Locke.*

The heaviness of any weight doth increase proportionably to its distance from the centre: thus one pound A at D, will *equiponderate* unto two pounds at B, if the distance A D is double unto A B. *Wilkins's Mathematical Magick.*

EQUIPO'NDIOUS, *adj.* Lat. *æquus* and *pondus.* Equilibrated; equal on either part.

The scepticks affected an indifferent *equipondious* neutrality, as the only means to their ataraxia. *Glanville's Scepsis.*

EQUISETUM, horse-tail, a genus of the order of filices, and cryptogamia class of plants; natural order fifty-first, coniferæ. There is a spike of peltated or shielded fructifications opening at the base. There are eight species: of which the most remarkable are the following:—

1. E. arvense, the common or corn horse-tail, grows in wet meadows and corn fields. The most remarkable property of this is, that its seeds, when viewed by a microscope, are seen to leap about as if they were animated. It has a very astringent and diuretic quality, and has been esteemed serviceable in the hæmaturia and gonorrhœa, but is disregarded in the present practice. It is a troublesome plant in pastures; and disagreeable to cows, being never touched by them unless they are compelled by hunger, and then it brings on an incurable diarrhœa. It does not seem to affect horses or sheep.

2. E. fluviatile, the great river horse-tail, is frequent in shady marshes, and on the brinks of stagnant waters. It is the largest of all the species, growing sometimes to the height of a yard, and nearly an inch in diameter. Haller tells us that this species was eaten by the Romans; and Linnæus informs us that oxen and reindeer are fond of it, but that horses refuse it.

3. E. hyemale, rough horse-tail, shave-grass, or Dutch rushes. This is much used by the whitesmiths and cabinet-makers, under the name of Dutch rushes, for polishing their metals and wood. All the other species will answer this purpose in some degree, but this better than any of the rest. In Northumberland the dairy maids scour and clean their milk-pails with it. Some imagine that, if cows are fed with this species, their teeth will fall out.

4. E. sylvaticum, the wood horse-tail. It grows in woods and moist shady places, in many parts of England and Scotland. The stalk rises from twelve to eighteen inches high, angular, and rough to the touch; the angles being edged with sharp spiculæ, scarcely visible without a microscope. The leaves grow verticillate, twelve or more in a whorl, and these whorls are about an inch distant from one another. The leaves are very slender, nearly quadrangular, about five inches long, pendent, and beset with several other secondary whorls, so that it resembles a pine-tree in miniature. Horses are very fond of this plant; and in some parts of Sweden it is collected to serve them as winter food.

EQUITES, amongst the Romans, were persons of the second degree of nobility, next to the senators in point of rank. The equites or knights were required to be possessed of 400 sestertia before they could be admitted into that order; and when they were so reduced as to fall short of the prescribed revenue, they were expunged out of the equestrian list. This revenue amounted to about 10,000 crowns. Part of the ceremony whereby the honor of knighthood was conferred amongst the Romans was the giving of a horse; every eques received also the stipend of a horseman to serve in the wars, and wore a ring which was given him by the state. The equites composed a large body of men, and constituted the Roman cavalry; for there was always a sufficient number of them in the city, and nothing but a review was requisite to fit them for service. The knights at last grew too powerful, became a balance for the senate and people, neglected the exercises of war, and betook themselves to civil employments. The equites were liable to be punished by the censors, and to suffer degradation. They were degraded by taking from them the horse which was kept for each of them at the public charge; this was called equum adimere.

E'QUITY, *n. s.* } Fr. *equité;* Lat. *æquitus.*
E'QUITABLE, *adj.* } Justice; right; honesty,
E'QUITABLY, *adv.* } fairness.

For sothe a word makynge and ende and abreggynge in *equyte*, for the lord schal make a word breggid on al the erthe. *Wiclif. Romaynes* 2.

Liking their own somewhat better than other mens, even because they are their own, they must in *equity* allow us to be like unto them in this affection. *Hooker.*

Foul subordination is predominant,
And *equity* exiled your highness' land.
*Shakspeare.*

*Equity* is a roguish thing; for law we have a measure, and know what to trust to: *equity* is according to the conscience of him that is chancellor, and as that is larger or narrower, so is *equity*. 'Tis all one as if

they should make his foot the standard for the measure we call a chancellor's foot, what an uncertain measure this would be! One chancellor has a long foot, another a short foot, a third an indifferent foot: 'tis the same thing in the chancellor's conscience. *Selden.*

Christianity secures both the private interests of men and the publick peace, enforcing all justice and *equity.* *Tillotson.*

It seems but *equitable* to give the artists leave to name them as they please. *Boyle's Scept. Chemist.*

To carry this a little farther. Here is one muffled up in the zeal and infallibility of his own sect, and will not touch a book, or enter into debate with a person that will question any of those things which to him are sacred. Another surveys our differences in religion with an *equitable* and fair indifference, and so finds probably that none of them are in every thing unexceptionable. *Locke.*

That, under *equitable* government, tne protection of law is an unspeakable advantage, will appear to those who consider, that a good citizen has the whole power of the state engaged on his side, to vindicate his rights, and guard him from injury. *Beattie.*

I never will believe, the colonel cries,
The sanguinary scenes that some devise,
Who make the good Creator on their plan
A being of less *equity* than man. *Cowper.*

Equity, in jurisprudence, is defined a correction or qualification of the law, generally made in that part wherein it faileth or is too severe. It likewise signifieth the extension of the words of the law to cases unexpressed, yet having the same reason; so that where one thing is enacted by statute all other things are enacted that are of the like degree: e. g. the statute of Gloucester gives action of waste against him that holds lands for life or years: and, by the equity thereof, a man shall have action of waste against a tenant that holds but for one year, or one half year, which is without the words of the act, but within the meaning of it; and the words that enact the one, by equity enact the other. So that equity is of two kinds. The one abridges and takes from the letter of the law: the other enlarges and adds to it: and statutes may be construed according to equity, especially where they give remedy for wrong, or are for expedition of justice. Equity seems to be the interposing law of reason, exercised by the lord chancellor in extraordinary matters to do equal justice; and, by supplying the defects of the law, gives remedy in all cases.

'The essential difference,' says Blackstone, 'between law and equity principally consists in the different modes of administering justice in each, in the mode of proof, the mode of trial, and the mode of relief. Upon these, and upon two other accidental grounds of jurisdiction, viz. the true construction of securities for money lent, and the form or effect of a trust or second use, hath been principally erected that structure of jurisprudence which prevails in our courts of equity, and is inwardly bottomed upon the same substantial foundations as the system of the courts of common law.

As to the mode of *proof*. When facts, or their leading circumstances, rest only in the knowledge of the party, a court of equity applies itself to his conscience, and purges him, upon oath, with regard to the truth of the transaction; and that being once discovered, the judgment is the sam in equity as it would have been at law. But, f want of this discovery at law, the courts of equit have acquired a concurrent jurisdiction wi every other court in all matters of accoun 1 Chan. C. 57. As incident to accounts, the take a concurrent cognizance of the administr tion of personal assets, 2 P. Wms. 145., co sequently of debts, legacies, the distribution the residue, and the conduct of executors and a ministrators. 2 Chan. c. 152. As incident accounts, they also take the concurrent jurisdi tion of tithes, and all questions relating theret 1 Eq. C. Ab. 367; of all dealings in partnershi 2 Vern. 277, and many other mercantile transa tions; and so of bailiffs, receivers, factors, an agents. Ibid. 638. From the same fruitful sour the compulsive discovery upon oath, the cour of equity have acquired a jurisdiction over almo all matters of fraud, 2 Chan. C. 46: all matte in the private knowledge of the party, whic though concealed, are binding in conscience, an all judgments at law obtained through such frau or concealment. And this not by impeaching reversing the judgment itself, but by prohibitin the plaintiff from taking an advantage of a jud ment obtained by suppressing the truth. 3. Wms. 148. *Year book*, 22 *Ed. IV.* 37. p. 21.

The mode of *trial*, is by interrogatories a ministered to the witnesses, upon which th depositions are taken in writing, wherever the happen to reside. If, therefore, the cause aris in a foreign country, and the witnesses resi upon the spot; if, in causes arising in Englan the witnesses are abroad, or shortly to leave th kingdom; or, if the witnesses residing at hom are aged or infirm; any of these cases lays ground for a court of equity to grant a commi sion to examine them, and, in consequence, exercise the same jurisdiction which might ha been exercised at law if the witnesses coul probably attend.

With respect to the mode of *relief*.—The wa of a more specific remedy than can be obtain in the courts of law, gives a concurrent juris tion to a court of equity in a great variety cases. To instance in executory agreement A court of equity will compel them to be carri into strict execution, unless where it is imprope or impossible; instead of giving damages for the non-performance. Eq. Ca. Ab. 16. And hen a fiction is established, that what ought to b done shall be considered as being actually don and shall relate back to the time when it oug to have been done originally; and this fiction so closely pursued through all its consequence that it necessarily branches out into many rul of jurisprudence, which form a certain regul system. 3 P. Wms. 215. So, of waste, and oth similar injuries, a court of equity takes a concu rent cognizance, in order to prevent them by i junction. 1 Ch. Rep. 14. 2 Ch. C. 32. Ov questions that may be tried at law, in a gre multiplicity of actions, a court of equity assume a jurisdiction, to prevent the expense and vex tion of endless litigation and suits. 1 Vern. 308 Pre. Ch. 261. 1 Pr. Wms. 672. Stra. 404. I various kinds of fraud it assumes a concurren jurisdiction, not only for the sake of a discovery

but of a more extensive and specific relief, 2 P. Wms. 156; as by setting aside fraudulent deeds, decreeing re-conveyances, or directing an absolute conveyance merely to stand as a security, 1 Vern. 32. 1 P. Wms. 239. 1 Vern. 237. 2 Vern. 84; and thus, lastly, for the sake of a more beneficial and complete relief, by decreeing a sale of lands, a court of equity holds plea of all debts, incumbrances, and charges that may affect it, or issue thereout. 1 Eq. Ca. Ab. 337.

As to the construction of securities for money lent; when courts of equity held the penalty of a bond to be the form, and that in substance it was only as a pledge to secure the repayment of the sum bonâ fide advanced, with a proper compensation for the use, they laid the foundation of a regular series of determinations, which have settled the doctrine of personal pledges or securities, and are equally applicable to mortgages of real property. The mortgagor continues owner of the land, the mortgagee of the money lent upon it: but this ownership is mutually transferred, and the mortgagor is barred from redemption, if, when called upon by the mortgagee, he does not redeem within a time limited by the court: or he may, when out of possession, be barred, by length of time, by analogy to the statute of limitations.

The form of a trust, or second use, gives the courts of equity an exclusive jurisdiction, as to the subject matter of all settlements and devises in that form, and of all the long terms created in the present complicated mode of conveyancing. This is a very ample source of jurisdiction: but the trust is governed by very nearly the same rules as would govern the estate in a court of law, if no trustee was interposed; 2 P. Wms. 645, 668, 669. And by a regular positive system, established in the courts of equity, the doctrine of trusts is now reduced to as great a certainty as that of legal estates in the courts of common law.' See 3 Comm. 436--440. See CHANCERY and LAW.

EQUITY OF REDEMPTION, on mortgages, is the right which a man has of redeeming his estate upon payment of the money borrowed. This enables a mortgagor to call on the mortgagee who [is in] possession of his estate to deliver it back, and account for the rents and profits received, on payment of his whole debt and interest: thereby turning the mortuum into a kind of vivum vadium. But, on the other hand, the mortgagee may either compel the sale of the estate in order to get the whole of his money immediately, or else call upon the mortgagor to redeem his estate, or, in default thereof, to be for ever foreclosed from redeeming the same, that is, to lose his equity of redemption without possibility of recall. And also in some cases of fraudulent mortgages (stat. 4 & 5 W. & M. c. 16.), the fraudulent mortgagor forfeits all equity of redemption whatsoever. This is done by proceedings in the court of chancery. But the chancery cannot shorten the time of payment of the mortgage money, where it is limited by express covenant, though it may lengthen it; and then, upon non-payment, the practice is to foreclose the equity of redemption of the mortgagor. 2 *Vent*. 364.

To foreclose the equity, a bill in chancery is exhibited, to which an answer is put in, and, a decree being obtained, a master in chancery is to certify what is due for principal, interest, and costs, which are to be prefixed by the decree, whereupon the premises are to be re-conveyed to the mortgagor; or, in default of payment, the mortgagor is ordered to be foreclosed from all equity of redemption, and to convey the premises absolutely to the mortgagee. Law of Securities, p. 129, 133. By stat. 7 Geo. II. cap. 20, after payment or tender by the mortgagor of principal, interest, and costs, the mortgagee can maintain no ejectment, but may be compelled to re-assign his securities.

EQUITY, in mythology, sometimes confounded with Justice, a goddess among the Greeks and Romans, represented with a sword in one hand and a balance in the other.

EQUIV'ALENCE, *n. s.* & *v. a.* } Lat. *æquus*
EQUIV'ALENCY, *n. s.* } and *valeo*,
EQUIV'ALENT, *n. s.* & *adj.* } to prevail.
Equality of power or value; to equiponderate; to be equal to. An equivalent is any thing equal in any quality or excellence expressed or implied.

The consideration of public utility is, by very good advice, judged at the least the *equivalent* to the easier kind of necessity. *Hooker.*

Must the servant of God be assured that which he nightly prays for shall be granted? Yes, either formally or by way of *equivalence*, either that or something better. *Hammond.*

Whether the transgression of Eve seducing did not exceed Adam seduced, or whether the resistibility of his reason did not *equivalence* the facility of her seduction, we shall refer to schoolmen. *Browne.*

The dread of Israel's foes, who, with a strength
*Equivalent* to angels, walked their streets,
None offering fight. *Milton's Agonistes.*

No fair to thine
*Equivalent* or second! which compelled
All thus, though importune perhaps, to come
And gaze, and worship thee. *Milton.*

The slave without a ransom shall be sent:
It rests for you to make the *equivalent*. *Dryden.*

The use of the word minister is brought down to the literal signification of it, a servant; for now to serve and to minister, servile and ministerial, are terms *equivalent*. *South.*

A man of wit, genius, learning, is apt to think it something hard, that men of no wit, no genius, no learning, should have a greater share of wealth and honours; not considering that their own accomplishment ought to be reckoned to them as their *equivalent*. It is no reason that a person worth five thousand pounds, should, on that account, have a claim to twenty. *Shenstone.*

That there is any *equivalence* or parity of worth betwixt the good we do to our brother, and the good we hope for from God, all good Protestants do deny. *Smalridge.*

Civil causes are equivalent unto criminal causes, but this *equivalency* only respects the careful and diligent admission of proofs. *Ayliffe's Parergon.*

Things
Well nigh *equivalent*, and neighbouring value,
By lot are parted; but the value, high heaven, thy share,
In equal balance laid with earth and hell,
Flings up the adverse scale and shuns proportion.
*Prior.*

Fancy a regular obedience to one law will be a full *equivalent* for their breach of another. *Rogers.*

The characteristic style of the Hebrew poets, who delight in subjoining to one proposition a corresponding clause which has an *equivalent* or opposite sense, affords frequent explanations of obscure passages by the parallelism. *Archbp. Newcome.*

There is probably no country so barbarous that would not disclose all it knew, if it received from the traveller *equivalent* information. *Goldsmith.*

EQUIVALENT TERMS are where several words that differ in sound have yet one and the same signification; as every body was there, and nobody was absent; nihil non, and omne.

EQUIVALENT THINGS are either moral, physical, or statical. 1. Moral; e. g. the commanding or advising a murder is a guilt equivalent to that of the murderer. 2. Physical; a man who has the strength of two men is said to be equivalent to two men. 3. Statical; a less weight becomes equivalent in force with a greater, by having its distance from the centre increased.

EQUIVALENTS. See CHEMISTRY, Appendix.

EQUIV'OCAL, *adj.* & *n. s.* } Lat. *æquivocus*; of *æquus*. and *voco*, to speak.
EQUIV'OCALLY, *adv.*
EQUIV'OCALNESS, *n. s.*
Of doubtful meaning; standing for different notions, or things: uncertain; irregular.

These sentences to sugar or to gall,
Being strong on both sides, are *equivocal*.
*Shakspeare.*

Words of different significations, taken in general, are of an *equivocal* sense; but being considered with all their particular circumstances, they have their sense restrained. *Stillingfleet.*

Prejudice is an *equivocal* term; and may as well mean right opinions taken upon trust, and deeply rooted in the mind, as false and absurd opinions so derived, and grown into it. *Hurd.*

There is no such thing as *equivocal* or spontaneous generation; but all animals are generated by animal parents of the same species with themselves. *Ray.*

Words abstracted from their proper sense and signification, lose the nature of words, and are only *equivocally* so called. *South.*

Distinguish the *equivocalness* or lassitude of the word, and then point out that determinate part which is the ground of my demonstration. *Norris.*

No insect or animal did ever proceed *equivocally* from putrefaction, unless in miraculous cases; as in Egypt by the divine judgments. *Bentley.*

*Equivocal* generation is the production of plants without seed, or of insects or animals without parents, in the natural way of coition between male and female; which is now believed never to happen but that all bodies are unequivocally produced.
*Harris.*

The greater number of those who held this were misguided by *equivocal* terms. *Swift.*

Shall two or three wretched *equivocals* have the force to corrupt us? *Dennis.*

Those half-learned witlings, numerous in our isle
As half-formed insects on the Banks of Nile;
Unfinished things, one knows not what to call,
Their generation's so *equivocal*. *Pope.*

EQUIV'OCATE, *v. n.* } Lat. *æquivocatio*; *æquus* and *voco*. See EQUIVOCAL. To use
EQUIV'OCATION, *n. s.*
EQUIVOCA'TOR, *n. s.*
ambiguous expressions, or words of double meaning; to mean one thing and express another.

Here's an *equivocator*, that would swear in both the scales against either scale; yet could not *equivocate* to Heaven. *Shakspeare.*

Reproof is easily misapplied, and through *equivocation*, wrested.

I pull in resolution, and begin
To doubt the *equivocation* of the fiend
That lies like truth. *Shakspeare. Macbeth.*

Who sees not how no place can be left for truth, where there is full room given to *equivocation?*
*Bp. Hall.*

Not only Jesuits can *equivocate?* *Dryden.*

My soul disdained a promise;——
—But yet your false *equivocating* tongue,
Your looks, your eyes, your every motion promised:
But you are ripe in frauds, and learned in falsehoods.
*Smith.*

EQUULEUS, or ECCULEUS, in antiquity, a kind of rack used for extorting a confession, at first chiefly practised on slaves, but afterwards made use of against the Christians. The equuleus was made of wood, having holes at certain distances, with a screw, by which the criminal was stretched to the third, sometimes to the fourth, or fifth holes, his arms and his legs being fastened on the equuleus with cords; and thus was hoisted aloft, and extended in such a manner, that all his bones were dislocated. In this state red-hot plates were applied to his body, and he was goaded in the sides with an instrument called ungula.

EQUULEUS, EQUICULUS, or EQUUS MINOR, in astronomy, the horse's head; a constellation of the northern hemisphere. See ASTRONOMY.

EQUUS, in zoology, a genus of quadrupeds belonging to the order of belluæ. They have six erect and parallel fore teeth in the upper jaw, and six somewhat prominent ones in the under jaw; one short tusk on each side of both jaws, at a considerable distance from the other teeth; and the feet consist of an undivided hoof. This genus is the only race of quadrupeds, in which the mammæ are wanting on the males. Mr. Kerr enumerates six species.

I. EQUUS ASINUS, the ass, has long slouching ears, solid hoofs, short mane, and tail covered with long hairs at the end. The body is usually of an ash color, with a dusky cross on the shoulders. Gmelin describes two varieties, besides hybrids or mules, viz.

1. EQUUS ASINUS DOMESTICUS, the tame or domestic ass, is an humble, patient, and quiet animal. He submits with firmness to strokes and chastisement; he is temperate both as to the quantity and quality of his food; he contents himself with the rigid and disagreeable herbage which the horse and other animals leave to him and disdain to eat; he is more delicate with regard to his drink, never using water unless it be perfectly pure. As his master does not take the trouble of combing him, he often rolls himself on the turf among thistles, ferns, &c. Without regarding what he is carrying, he lies down to roll as often as he can, seeming to reproach his masters with neglect and want of attention. When very young, the ass is a gay, sprightly, nimble, and gentle animal. But he soon loses these qualities, probably by the bad usage he meets with; and becomes lazy, untractable, and stubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is

strong. Pliny assures us, that when an experiment was made to discover the strength of maternal affection in a she ass, she ran through the flames in order to come at her colt. Although the ass be generally ill used, he discovers a great attachment to his master; he smells him at a distance, searches the places and roads he used to frequent, and easily distinguishes him from other men. The ass has a very fine eye, an excellent scent, and a good ear. When overloaded, he hangs his head, and sinks his ears; when too much teased or tormented, he opens his mouth and retracts his lips in a disagreeable manner. If you cover his eyes, he will not move another step; if you lay him on his side, and place his head so that one eye rests on the ground, and cover the other with a cloth, he will remain in this situation without making any attempt to get up. He walks, trots, and gallops in the same manner as the horse, but all his motions are slower. Whatever pace he is going at, if pushed, he instantly stops. The cry of the horse is called neighing; that of the ass braying, which is a long disagreeable noise, consisting of alternate discords from sharp to grave and from grave to sharp; he seldom cries but when pressed with hunger or love; the voice of the female is clearer and more piercing than that of the male. The ass is less subject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardness and dryness of his skin; and it is perhaps for the same reason that he is less sensible to the whip and spur than the horse. The teeth of the ass fall out and grow at the same age and in the same manner as those of the horse; and he has nearly the same marks in his mouth. Asses are capable of propagating when two years old. The females are in season in May and June. The milk appears in the dugs ten months after impregnation; she brings forth in the twelfth month, and always one at a time. Seven days after the birth, the season of the female returns, and she is again in a condition to receive the male. The colt should be taken from her at the end of five or six months, that the growth and nourishment of the fœtus may not be obstructed. The stallion or jack-ass should be the largest and strongest that can be found: he should be at least three years old, and never ought to exceed ten. Mules are the offspring of the horse and ass, or the jack-ass and mare. See MULE. Mr. Pennant mentions a mule produced between a jack-ass and a female zebra.

The ass, like the horse, continues growing three or four years, and lives till he is twenty-five or thirty; he sleeps less than the horse, and never lies down but when excessively fatigued. He is more robust, and less subject to disease than the horse. Travellers inform us, that there are two sorts of asses in Persia: one of which is used for burdens, they being slow and heavy; the other kept like horses for the saddle: for they have smooth hair, carry their head well, and are much quicker in their motion; but when they ride them, they sit nearer their buttocks than when on a horse; they are dressed like horses, and are taught to amble like them; but they generally cleave their nostrils to give more room for breathing. Dr. Russell tells us, that they have two sorts in Syria; one of which is like ours, and the other very large; with remarkably long ears; but they are both used to carry burdens. In America there were originally no asses, but they were carried thither first by the Spaniards, and afterwards by other nations, where they multiplied greatly; insomuch, that, in some places, there are whole droves of them that run wild, and are not easily caught. Asses in general carry the heaviest burdens in proportion to their bulk; and, as their keeping costs little or nothing, it is surprising that they are not put to more uses than they generally are among us. The flesh of the common ass is never eaten in Europe; though some say, that of their colts is tender, and not disagreeable.

2. EQUUS ASINUS FERUS, the wild ass, the onager, of Oppian, Pliny, Ray, &c., and the koulan of Mr. Pennant, varies from the tame in several respects, and requires a more particular description. The forehead is much arched; the ears are long and erect, even when the animal is out of order; sharp-pointed, and lined with whitish curling hairs; the irides are of a livid brown; the lips thick; and the end of the nose sloping steeply down to the upper lip; and the nostrils are large and oval. It is much higher on its limbs than the tame ass, and its legs are much finer, but it again resembles it in the narrowness of its chest and body; it carries its head much higher; and its skull is of a surprising thinness. The mane is dusky, about three or four inches long, composed of soft woolly hair, and extends quite to the shoulders; the hairs at the end of the tail are coarse, and about a span long. The color of the hair in general is silvery white; the upper part of the face, the sides of the neck, and body, are of a flaxen color; the hind parts of the thighs are the same; the fore part divided from the flank by a white line, which extends round the rump to the tail; the belly and legs are also white; along the very top of the back, from the mane quite to the tail, runs a stripe of bushy waved hairs of a coffee-color, broadest above the hind part, and growing narrower again towards the tail; another of the same color crosses it at the shoulders (of the males only), forming a mark, such as distinguishes the tame asses; the dorsal band and the mane are bounded on each side by a beautiful line of white, well described by Oppian, who gives an admirable account of the whole. Its winter coat is very fine, soft, and silky, much undulated, and likest to the hair of the camel; greasy to the touch; and the flaxen color, during that season, more exquisitely bright. Its summer coat is very smooth, silky, and even, with the exception of certain shaded rays that mark the sides of the neck, pointing downwards These animals inhabit the dry and mountainous parts of the deserts of Great Tartary, but not higher than latitude 48°. They are migratory, and arrive in vast troops to feed, during the summer, in the tracts east and north of lake Aral. About autumn they collect in hundreds, and direct their course towards the north of India, to enjoy a warm retreat during winter. But Persia is their most usual place of retirement; where they are found in the mountains of Casbin, some even at all times of the year. Barboga says, they penetrate even into the southern parts of India, to the mountains of Malabar and Golconda. According to Leo Africanus, wild asses of an ash

color are found in the north deserts of Africa. The Arabs take them in snares for the sake of their flesh. If fresh killed, it is hot and unsavory; if kept two days after it is boiled, it becomes excellent meat. These people, the Tartars, and Romans, agreed in their preference of this to any other food, the latter indeed chose them young, at a period of life in which it was called lalisio (See Martial xiii. 97). The epicures of Rome preferred those of Africa to all others. Full grown onagri were introduced among the spectacles of the theatre; and their combats were preferred even to those of the elephants. The manners of the wild ass are very much the same with those of the wild horse. They assemble in troops under the conduct of a leader, and are very shy. They will, however, stop in the midst of their course, and even suffer the approach of a man at that instant, but will then dart away with the rapidity of an arrow from the bow. This Herodotus mentions, in his account of those of Mesopotamia; and Leo Africanus, in that of the African. Their wildness is beautifully described in Scripture. See Job xxxix. 5—8. Yet they can be tamed; the Persians catch and break them for the draught: they make pits, half filled with plants to lessen the fall, and take them alive, when they break, and hold them in great esteem. The famous breed of asses in the East is produced from the koulan reclaimed from the savage state, which highly improves the breed. The Romans reckoned the breed of asses produced from the onager and tame ass to excel all others. The Tartars, who kill them for the sake of the flesh and skins, lie in ambush and shoot them. They have been at all times celebrated for their amazing swiftness. Their food is the saltest plants of the deserts, such as the kalis, atriplex, chenopodium, and the bitter milky tribe of herbs, &c.; they also prefer salt-water to fresh. This is exactly conformable to the history given of this animal in the book of Job; for the words 'barren land,' expressive of its dwelling, ought, according to the learned Bochart, to be rendered 'salt places.' The hunters lie in wait for them near the ponds of brackish water, to which they resort to drink; but they seldom have recourse to water. These animals were anciently found in the Holy Land, Syria, the land of Uz or Arabia Deserta, Mesopotamia, Phrygia, and Lycaonia. But at present they are entirely confined to the countries above mentioned. Shagrin is made of the skin of these animals. See SHAGRIN. The Persians use the bile of the wild ass as a remedy against dimness of sight.

II. EQUUS BISULCUS, the Chilese horse, in the size, number, and arrangement of teeth, as well as general appearance, resembles the horse; and is therefore ranked by Gmelin in this genus, though it differs from all the other species in having cloven hoofs. In its size, hair, color, nose, eyes, neck, back, tail, legs, genitals, and internal structure, it resembles the ass, but wants the dusky cross on its shoulders. It resembles the horse in the figure of its ears, and the sound of its voice; and, according to Molina, in the size and position of its teeth. Hence Mr. Kerr supposes, it may be only a wild horse, degenerated through the inclemency of the mountainous district it inhabits, in the Andes, in South America; and that 'the circumstance of its having cloven hoofs may be exaggerated, or only a mistake.' Some naturalists are inclined to consider it as belonging to the camel tribe, and the genus auchenia.

III. EQUUS CABALLUS, the horse, has a long flowing mane, and the tail covered on all parts with long hairs. Even in a domestic state he is a bold and fiery animal: equally intrepid as his master, he faces danger and death with ardor and magnanimity. He delights in the noise and tumult of arms, and seems to feel the glory of victory; he exults in the chase; his eyes sparkle with emulation in the course. But, though bold and intrepid, he is docile and tractable; he knows how to check the natural vivacity and fire of his temper. He not only yields to the hand, but seems to consult the inclination of his rider; constantly obedient to the impressions he receives, his motions are entirely regulated by the will of his master. He in some measure resigns his very existence to the pleasure of man. He delivers up his whole powers; he reserves nothing; he will rather die than disobey. Who could endure to see a character so noble abused? Who could be guilty of such gross barbarity! This character, though natural to the animal, is in some measure the effect of education. His education commences with the loss of liberty, and is finished by constraint. The slavery of the horse is so ancient and so universal, that he is but rarely seen in a natural state. Several ancient writers talk of wild horses, and even mention the places where they are to be found. Herodotus takes notice of white savage horses in Scythia; Aristotle says they were to be found in Syria; Pliny, in the northern regions; and Strabo, in Spain and the Alps. In more recent times, Cardan says, that wild horses are to be found in the Highlands of Scotland and the Orkney Isles; Olaus, in Muscovy; Dapper, in the island of Cyprus; Leo and Marmol, in Arabia and Africa, &c. But, as Europe is almost all inhabited, wild horses are not to be met with in any part of it; and those of America were originally transported from Europe by the Spaniards; for this species of animals did not exist in the New World. The Spaniards carried over a great number of horses, left them in different islands, &c., with a view to propagate that useful animal in their colonies. These have sometimes multiplied incredibly, in the vast deserts of those thinly peopled countries, and roamed at large without any restraint. M. de Salle relates, that he saw, in the year 1685, horses feeding in the meadows of North America, near the bay of St. Louis, which were so ferocious that nobody durst come near them. Oexmelin says, that he has seen large troops of them in St. Domingo running in the valleys; that when any person approached, they all stopped; and one of them would advance till within a certain distance, then snort, take to his heels, and the whole troop after him. Every author, who notices these horses of America, describes them as smaller and less handsome than those of Europe. These relations sufficiently prove, that the horse, when at full liberty, though not a fierce or dangerous animal, has no inclination to associate with mankind; that all the soft-

ness and ductility of his temper proceeds entirely from the culture and polish he receives in his domestic education, which in some measure commences as soon as he is brought forth. The motions of the horse are chiefly regulated by the bit and the spur; the bit informs him how to direct his course, and the spur quickens his pace. The mouth of the horse is endowed with amazing sensibility; the slightest motion or pressure of the bit gives him warning, and instantly determines his course. The horse has not only a grandeur in his general appearance, but there is the greatest symmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head give him an air of lightness, which is well supported by the strength and beauty of his chest. He erects his head as if willing to exalt himself above the condition of other quadrupeds: his eyes are open and lively; his ears are handsome, and of a proper height; his mane adorns his neck, and gives him the appearance of strength and boldness. At the age of two years, or two years and a half, the horse is in a condition to propagate; and the mare, like most other females, is ready to receive him still sooner. But the foals produced by such early embraces are generally ill-made and weakly. The horse should never be admitted to the mare till he is four or four and a half; this is only meant with regard to draught horses. Fine horses should not be admitted to the mare before they are six years old, and Spanish stallions not till seven. The mares are generally in season from the beginning of April to the end of June; but their chief ardor for the horse lasts but about fifteen or twenty days, and this critical season should always be embraced. The stallion ought to be sound, well made, vigorous, and of a good breed. Mares go with young eleven months and some days. They bring forth standing: contrary to the course of most other quadrupeds, who lie during this operation. They continue to bring forth till the age of sixteen or eighteen years; and both horses and mares live between twenty-five and thirty years. Horses cast their hair once a year, generally in the spring, but sometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other season. In Persia, Arabia, and most eastern countries, they never geld their horses, as is done in Europe and China. This operation greatly diminishes their strength, courage, and spirit; but it makes them good-humored, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: some geld their horses when a year old, and others at eighteen months. But the best and most general practice is to delay the operation till they are two years old, as they thus retain more of the strength and other qualities of the male.—For the breeding, rearing, &c., of horses, and the technical description of the parts, &c., see the articles HORSE, STALLION, &c.; for the method of training and managing them, see HORSEMANSHIP; and for their diseases and cure, VETERINARY ARTS.

IV. EQUUS HEMIONUS of Pallas, the Ἡμιονος, or half ass, of Aristotle and Pliny, the czigithai of Buffon, and the dshikketei, fecund, or wild mule of Pennant, is of the size and appearance of the common mule, with a large head, flat forehead growing narrow toward the nose, eyes of a middle size, the irides of an obscure ash color: thirty-eight teeth in all, being two in number fewer than in a common horse; ears much longer than those of a horse, quite erect, lined with a thick whitish curling coat; neck slender, compressed; mane upright, short, soft, of a grayish color; in place of the foretop, a short tuft of downy hair about an inch and three quarters long. The body is rather long, and the back very little elevated; the breast protuberant and sharp. The limbs are long and elegant; the thighs thin as a mule's. Within the fore legs there is an oval callus; in the hind legs none. The hoofs are oblong, smooth, and black; the tail is like that of a cow, slender, and for half of its length naked, and the rest covered with long ash-colored hairs. Its winter coat is gray at the tips, of a brownish ash-color beneath, about two inches long, in softness like the hair of a camel, and undulated on the back. Its summer coat is much shorter, of a most elegant smoothness, and in all parts marked most beautifully with small vortexes. The end of the nose is white; from thence to the foretop inclining to tawny. The buttocks are white; as are the inside of the limbs and belly. From the mane a blackish testaceous line extends along the top of the back to the tail, broadest on the loins, and growing narrower towards the tail. The color of the upper part of the body is a light yellowish gray, growing paler towards the sides. The length, from the tip of the nose to the base of the tail, is six feet seven inches; length of the trunk of the tail, one foot four; of the hairs beyond the end, eight inches. The height of the animal is three feet nine. This species inhabits the deserts between the rivers Onon and Argun in the most southern part of Siberia, and extends over the vast plains and deserts of Western Tartary, and the celebrated sandy desert of Gobi, which reaches even to India. In Siberia they are seen only in small numbers, as if detached from the numerous herds to the south of the Russian dominions. In Tartary they are found about Taricnoor, a salt lake at times dried up. They shun wooded tracts, and lofty snowy mountains. They live in separate herds, each consisting of a chief, a number of mares and colts, in all to the number of about twenty; but seldom so many, for commonly each male has but five and sometimes fewer females. They copulate towards the middle or end of August; and bring, for the most part, but one at a time, which, by the third year, attains its full growth, form, and color. The young males are then driven away from their paternal herds, and keep at a distance till they can find mates of their own age which have quitted their dams. These animals also carry their heads horizontally; but, when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horse. They fight by biting and kicking, as usual with the horse: they are fierce and untameable; and even those which have been taken young, are so intractable as not to be broken by any art which the wandering Tartars could use. Yet

were it possible to bring them into fit places, and to provide all the conveniences known in Europe, the task might be effected; but it is doubted whether the subdued animal would retain the swiftness for which it is so celebrated in its state of nature. It exceeds that of the antelope; it is even proverbial; and the inhabitants of Thibet, from the fame of its rapid speed, mount on it Chammo, their god of fire. The Mongalians despair of ever taking them by the chase; but lurk behind some tomb, or in some ditch, and shoot them when they come to drink or eat the salt of the desert. They are excessively fearful animals, and provident against danger. A male takes on him the care of the herd, and is always on the watch. If they see a hunter, who by creeping along the ground has got near them, the sentinel takes a great circuit, and goes round and round him, as discovering somewhat to be apprehended. As soon as the animal is satisfied, it rejoins the herd, which sets off with great precipitation. Sometimes its curiosity costs its life; for it approaches so near as to give the hunter an opportunity of shooting it. But it is observed that, in rainy or in stormy weather, these animals seem very dull, and less sensible of the approach of mankind. The Mongalians and Tungusi, according to Du Halden, kill them for the sake of their flesh, which they prefer to that of horses, and even to that of the wild boar, esteeming it equally nourishing and wholesome. The skin is also used for making boots. Their senses of hearing and smelling are most exquisite: so that they are approached with the utmost difficulty. The Mongalians call them dshikketei, which signifies the eared; the Chinese, yo-to-tse, or mule. In ancient times this species extended far south. It was found in Syria in the time of Aristotle, who celebrates it for its amazing swiftness and fecundity, a breeding mule being thought a prodigy (see MULE); and Pliny, from the report of Theophrastus, mentions this species as found in Cappadocia.

V. EQUUS QUAGGA, the quacha, is striped like the zebra on the head and body, but with fewer lines. The flanks are spotted; the rump is plain; the ground color of the head, neck, body, and rump, a bright bay: the belly, thighs, and legs, are white, and free from all marks. This species, till of late, has been supposed to be the female of the zebra; but recent observations prove that the male and female zebra are marked alike This differs likewise in being thicker and stronger made, and in being more tractable; for instance, one had been so far broken as to draw in a cart. The Hottentots also distinguish them from the former, by the names of quagga and opeagha.

VI. EQUU. ZEBRA has the figure and gracefulness of the horse, joined to the swiftness of the stag. He is about seven feet long, from the point of the muzzle to the origin of the tail, and about four feet high. The color of his skin is beautiful and uniform, consisting of alternate parallel rings of black and white, disposed in the most regular manner. He is generally less than the horse and larger than the ass. The zebra is found no where but in the east and south provinces of Africa, from Ethiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and use them for domestic purposes, but with little success. The zebra is hard-mouthed, and kicks when any person attempts to touch or come near him. He is restless and obstinate as a mule: but perhaps the wild horse is naturally as untractable as the zebra; and it is probable, if he were early accustomed to obedience and a domestic life, he would become as docile as the horse.

ER, a syllable in the middle of names or places, comes by contraction from the Saxon papa, dwellers.

ERA, *n. s.* Fr. *ere;* Lat. *æra.* According to some from A.ER.A. *annus erat Augusti.* See ÆRA. Some from Goth. *ar;* Swed. *ar,* time time as reckoned from one particular epoch.

The Mohammedan *era*, reckoning from the Hegira or flight of the prophet, has of itself a strong tendency to preserve that superstition, and prevent the Mussulmans from assimilating with the other nations.

*Thomas.*

Mr. Grey's Memoria Technica was designed as an artificial language to remember numbers, as of the *eras*, or dates of history. *Darwin.*

ERAD'IATE, *v. n.* } From Lat. *e* and *ra-*
ERADIA'TION, *n. s.* } *dius*, a ray. To shoot out in the manner of a ray of light.

A kind of life *eradiating* from intellect, &c.

*More.*

God gives me a heart humbly to converse with him, from whom alone are all the *eradiations* of true majesty. *King Charl*

ERAD'ICATE, *v. a.* } Fr. *eradication*,
ERADICA'TION, *n. s.* } Lat. *eradicare*,
ERAD'ICATIVE, *adj.* & *n. s.* } from *e* and *radix*,
*radicis* a root; (Gr. *ραδιξ*, a branch or bough. To pluck or tear up by the roots: hence to destroy completely; an eradicative (also used as an adjective) is a medicine that thus destroys disease.

He suffereth the poison of Nubia to be gathered, and Aconite to be *eradicated*, yet this not to be moved.

*Browne*

They affirm the roots of mandrakes give a shriek upon *eradication*, which is false below confutation.

*Id.*

If a gouty person can bring himself entirely to a milk diet, he may so change the whole juices of his body as to *eradicate* the distemper. *Arbuthnot.*

If vice cannot wholly be *eradicated*, it ought at least to be confined to particular objects. *Swift.*

Philosophy converses in more appropriated and abstracted terms; and thus by degrees *eradicates* the abundance of metaphor, which is used in the more early ages of society. *Darwin.*

ERAKLEA, or EREKLI, a town of European Turkey, in Romania, on the sea of Marmora, the ancient Heraclea. It has a double harbour, contains 7000 inhabitants, and is a Greek archbishop's see. Eighteen miles south of Rodosto, and forty-six west of Constantinople.

ERAMNOO, an island at the entrance of the gulf of Cutch, on the western coast of India, having a principal town of the same name. Long. 68° 40′ E., lat. 22° 32′ N.

ERANARCHA, a public officer among the ancient Greeks, whose business was to preside over and direct the alms and provisions made for

he poor. Cornelius Nepos, in his life of Epaminondas, seems to describe the office thus: When any person was reduced to poverty, taken captive, or had a daughter to marry, which he could not effect for want of money, &c., the eranarcha called an assembly of friends and neighbours, and taxed each according to his means and estate, to contribute towards his relief.

ERANES, in Grecian history, societies among the ancient Athenians, in which each member deposited, monthly, a certain sum, in the common treasury, which was destined for the relief of associates who labored under particular misfortunes. As soon as it was possible, they were obliged to refund the money, but without interest. The Athenians looked upon these societies as very useful among a commercial people, where disappointments and shipwrecks often produced sudden and unmerited misfortune.

ERANTHEMUM, in botany, a genus of the monogynia order, and diandria class of plants: COR. quinquefid, with the tube filiform; the antheræ without the tube; the stigma simple. Species five; mostly Cape shrubs.

ERASE', *v. a.* } Fr. *raser*; Lat. *erado*, *era-*
ERASE'MENT. } *sus*, from *e* and *rado*, to scrape. Gr. ρασσω, to cut or break. To excind; to expunge; blot out.

The heads of birds, for the most part, are given *rased*; that is, plucked off.

*Peacham on Blazoning.*

I think such a passage should make men very cautious, that they may not rashly incur any censure on his account, though undoubtedly the terror of the threatening is planted against any designed *erasement* or addition. *Doddridge.*

ERASED, in heraldry. The head or limb of any creature torn from the body, so as to appear jagged, is called erased. See the annexed figure. Argent a lion's head, erased gules.

ERASISTRATUS, in biography, a physician, of great reputation among the ancients, born at Cos, and a pupil of Chrysippus. His fame acquired him the esteem of Seleucus Nicanor, king of Syria, at whose court he resided for a considerable time. While there, Antiochus, the king's son, was seized with a disorder for which the physicians could afford no remedy, and Erasistratus was called in. He observed that whenever Stratonice, his father's wife, entered his apartment, Antiochus appeared confused, a blush and tremor spread over his frame, his pulse quickened, and his voice grew feeble. He instantly perceived the cause of the disease, and conceived at the same time a plan for its cure. He went to the king and informed him that Antiochus must die, as his illness was occasioned by a passion that could never be gratified. 'Who then is the object of his love?' exclaimed Seleucus. 'My wife,' answered Erasistratus. Seleucus urging him strongly not to occasion his son's death by refusing to give up his wife, Erasistratus demanded whether, if Stratonice were the object of his affections, he would yield her for the life of his son? To this the father replied, that he would willingly give up his wife, or his kingdom, for his son; and he was informed that he might then be at ease, for that if Antiochus were possessed of Stratonice his illness would soon be at an end.

The great character of Erasistratus, however, is founded upon more solid ground than this anecdote displays. He may be considered as the father of anatomical science, at least conjointly with Herophilus. Before these physicians, the human body had never been opened for anatomical research, which had been confined to the bodies of brutes. According to Galen, they dissected living criminals: but this seems contradicted by their assertion that the arteries are filled with air only, which they must have seen to be false had they opened a living subject. They described minutely the cerebrum and cerebellum, its cavities and ventricles, and maintained that the brain was the common 'sensorium,' or source of vital action, through the medium of the nerves. He also examined minutely the structure of the heart and of the great vessels, and was the first to point out the valvular apparatus, and its peculiar form in each of the cavities of that viscus. He affirmed that the veins divided in the liver, for the purpose of secreting the bile; and knew that the urine was secreted by the kidneys.

ERASMUS (Desiderius), a celebrated writer, born at Rotterdam, in 1467. He was the illegitimate son of one Gerard a native of Tergou, by the daughter of a physician. Gerard had determined to marry the mother of Erasmus, but was deceived by a false report of her death while he was in Italy, upon which he entered into orders. The original name of Erasmus was Gerard, but he changed it himself to the Latin Desiderius, and the Greek Erasmus, all signifying amiable. When about nine years of age, he was sent to Deventer in Guelderland, where he made great progress in his education. During his residence at Deventer, his mother, who was also there, died of the plague, and his father did not long survive her; by which he was left an orphan, under the care of three guardians, who resolved on bringing him up to a religious life, with the base intention of dividing his patrimony among themselves. With this view, they sent him from one convent to another, till at last, in 1486, he was induced to assume the religious habit among the canons regular in the monastery of Stein, near Tergou. After spending some time in this situation, he obtained a dispensation from his vows, and was invited by the archbishop of Cambray to reside with him. During his abode with this prelate he was ordained priest; but in 1496 he went to Paris, where he supported himself by giving private lectures. Next year he visited England, where he was kindly received by the most eminent scholars of the age; and here he first applied himself to the study of the Greek language. His early literary works were philological, as his Adagia; De Copiâ Verborum; and De ratione Conscribendi Epistolas. In 1503 we find him at Louvain, where he studied divinity under Adrian VI. The next year he published his Enchiridion Militis Christiani, a treatise on practical religion. About this time he paid another visit to England; and

in 1506 took the degree of D. D. at Turin, after which he went to Bologna; and thence to Venice, where he lived with the famous Aldus Manutius. Leaving Venice, he visited Padua and Rome, where many offers were made to induce him to remain; but he preferred an invitation which he received from Henry VIII. of England, and arrived here in 1510. He first resided with Sir Thomas More, where he wrote his Encomium Moriæ, or Eulogy on Folly. Being invited by bishop Fisher to Cambridge, he was there made lady Margaret's professor of divinity, and Greek professor. In 1514 we find him at Basil, preparing his New Testament, and the Epistles of Jerome, for the press: about this time he was nominated by Charles of Austria to a vacant bishopric in Sicily; but when he was informed of this preferment he refused it, considering himself unfit for such a station, though, as he says, the Sicilians were merry fellows, and might like such a bishop. His edition of the New Testament came out in 1516, being the first time it was printed in Greek. This was a work of amazing labor, and much impaired his health; but, though it drew upon him the censures of ignorant and envious divines, it met with a rapid sale. The church of Rome was now thrown into a violent ferment by the preaching of Luther; and Erasmus, whose bold ridicule of the monks doubtless contributed in part to their discredit, was loudly complained of. In 1519 he received a very courteous letter from Luther, to which he replied, styling Luther his dearest brother in Christ, and adding, 'the Lord Jesus grant you from day to day an increase of his spirit, for his own glory and the public good;' but as Erasmus did not openly avow the principles of the reformer, though it is certain he approved of them in his heart, this intimacy was of short continuance. In 1720, when the pope's nuncio solicited the emperor to punish Luther, and the elector of Saxony consulted Erasmus on the occasion, he observed, 'Luther has committed two unpardonable crimes; he has touched the pope upon the crown, and the monks upon the belly;' to which he added, 'I know that a bishopric is at my service, if I would but write against Luther; but he is a man of too great abilities easily to encounter; and to say the truth, I learn more from one page of his, than from all the volumes of Thomas Aquinas.' When his friend and patron, Mountjoy, exhorted him to the service, he replied, 'Nothing is more easy than to call Luther a blockhead; nothing less easy than to prove him so.' In 1522 he published his Colloquies, which gave great offence to the monks, who used to say, 'Erasmus laid the egg, and Luther hatched it.' He appears, indeed, to have been at a loss how to behave towards Luther, and escape the vengeance of the court of Rome; and the timidity with which he acted seems rather inconsistent with the knowledge and freedom he displayed in speaking and writing: 'I follow,' says he, 'the decisions of the court and emperor when they are right, which is acting religiously; I submit to them when they are wrong, which is acting prudently; and I think it lawful for good men to act thus, when there is no hope of obtaining more.' Erasmus was next engaged in a controversy with Scaliger and other scholars, who, in their great zeal for the purity of Latin composition, were for rejecting all words not to be found in the works of Cicero, whence they were denominated Ciceronians. In opposition to these pedants, Erasmus wrote the much admired dialogue, entitled Ciceronianus, which was printed in 1528 His learned work, De rectâ Latini Græcique Sermonis pronuntiatione, was also published this year. The last of his publications appeared in 1535, entitled Ecclesiastes, or, on the Manner of Preaching. He died at Basil, in 1536, and was buried honorably in the cathedral of that city. Erasmus, on the whole, was esteemed the most learned man of his age; and contributed, by his xample and his writings, to the restoration of learning in the several countries in which he occasionally resided. He had, however, many enemies; and as he did not embrace the reformation, and yet censured the corruptions of popery, he has been treated injuriously both by catholics and protestants. His works, in 10 vols. folio, were ably edited at Leyden in 1706, by M. Le Clerc.

ERASTIANS, a religious sect which arose in England during the time of the civil wars in 1647, thus called from their leader, Thomas Erastus, whose distinguishing doctrine it was, that the church had no right of discipline, that is, no regular power to excommunicate, censure, absolve, or decree, &c.

ERATO, from ερaω, I love, in mythology, the muse who presided over amorous poetry. To this muse was ascribed the invention of the lyre and lute; and she is represented with a garland of myrtles and roses, holding a lyre in one hand, and a bow in the other, and at her side a Cupid, with his torch. There was also a Nereid of this name.

ERATOSTHENES, a Cyrenæan philosopher, historian, and poet, styled for his learning Plato Minor. He had the care of the celebrated library at Alexandria: and was warmly patronised by Ptolemy Euergetes, by whose order he wrote a History of the Theban Kings of Egypt, whose succession had been entirely omitted by Manetho. He thus fixed the Egyptian chronology, and his authority is by many preferred to that of Manetho. He wrote other treatises, a catalogue of which is to be seen in Fabricius Vossius, &c. The only piece of his now remaining entire is a Description and Fabulous Account of the Stars. The fame of Erastosthenes however principally rests on his measurement of the earth, in which he ascertained that, at the time of the summer solstice, the sun at noon was vertical to the city of Syene, situate on the borders of Ethiopia, under the Tropic of Cancer. He imagined, and he was not far from the truth, that Alexandria and Syene were both under the same meridian. On these data he constructed a concave hemisphere at Alexandria, from the bottom of which arose a vertical stile, terminating at the centre of curvature of the hemisphere. Then, supposing the city of Syene to be in the vertical direction of the stile, he observed, that the arc, included between the foot of the stile and the extremity of its shadow, projected on the concavity of the

hemisphere by the meridian sun at the solstice, was equal to a fiftieth part of the whole circumference. Hence, he inferred, that the arc of the heavens comprised between Alexandria and Syene must be the same; and that the distance of the two cities must likewise be a similar arc, or a fiftieth part of the whole circumference of a great circle of the earth. He starved himself in old age through grief for the dimness of his sight, about the tenth or twelfth year of Ptolemy Epiphanes, A. A. C. 194.

ERBACH, a county of the Odenwald, in Franconia. Though generally mountainous, it is productive in corn wine, and pasturage. The population is about 24,200.

ERBACH, a town of Germany, on the river Mummling, capital of the above district: twenty miles north-east of Manheim.

ERBIL, the ancient Arbela, a town in the pachalic of Bagdad, Persia, situated on an eminence commanding an extensive and fruitful plain. It is surrounded by walls, and contains a population of about 2000 or 3000, almost all Kurds or Chaldeans. Mules are much used in the agriculture of the neighbourhood, which is productive both in grain and fruit. Not far from Erbil, Alexander the Great defeated Darius. Sixty miles east of Mosul.

ERCILLA (Zuniga Don Antonio de), an eminent Spanish poet, was born at Madrid in 1533. His father was a lawyer; but, dying while our author was only a child, his family would have been exposed to want, had not Isabella, the wife of Charles V., kindly received his surviving parent into her household. His mother, from this circumstance, was not only employed herself, but procured an office for her son as soon as his years permitted him to accept of it. He was appointed page to Philip, the son of the emperor, and in that capacity had an opportunity of traversing Italy, Germany, and the Low Countries. When Philip visited England, to solemnise his marriage with Mary, he made one of his retinue. We find him soon afterwards in America, whither he had gone with the troops destined to quell a revolt in Chili. It is well known that the inhabitants of the mountainous and temperate regions of South America, displayed a degree of adventurous courage and persevering exertion, in defence of their liberty and independence, which distinguished them remarkably from the other tribes of the New World, and surprised not a little their Spanish invaders. It was against this race that Ercilla, and the troops which he accompanied, were appointed to act. The poet obeyed the mandates of his country, but admired the conduct of those whom he was commanded to reduce. Their fearless intrepidity, and generous love of freedom, made a deep impression on his heart, and called forth the efforts of his muse. He recorded in heroic verse those interesting events of which he was a daily witness, and described those scenes that excited so much of his interest. The intervals of leisure, from the duties of the field or the camp, were the seasons he chose for celebrating the exploits and the virtues of his enemies. A poem which was thus formed he called Araucania, and it displays much of the ardor of the warrior, with much of that irregularity which his situation produced, and many of those real transactions in which his own valor was exercised. Neither the structure of the verse, nor the style of the narrative, is uniformly good; there being many prosaic lines in the one, and a ludicrous mixture of fable and reality in the other. After remaining for a considerable time on the western continent, he returned to Spain with his health very much impaired; and after rambling for some time over different parts of Europe, he settled at Madrid, and passed his life in retirement, poverty, and poetry. The king, whom he served in the capacity of a page and a soldier, for whom he had performed the most menial offices, and the most adventurous exploits, whose praises he had sung, and under whose protection he had placed his poem, neglected and forgot him. He died about the end of the sixteenth century.

ERE, *adj.* & *prep.*
ERE-LONG, *adv.*
ERE-NOW, *adv.*
ERE-WHILE, *adv.*
} Saxon æn; Teut. *er*; Belg. *eer*; Goth. *ar*, soon. On and æn, being indiscriminately used in the Saxon, we often find *or* for *ere* in old English books. See the quotation from Daniel vi. So the old Apocrypha of 1578. 'He knew all things or ever they were made,' Ecclesiasticus xxxiii. 20. Before; sooner than: ere-long is before the lapse of any considerable time: ere-now before this time; and ere-while, some time since, before a little while.

The lions brake all their bones in pieces *or ever* they came to the bottom of the den. *Daniel.*

The wild horse having enmity with the stag, came to a man to desire aid, who mounted upon his back, and following the stag, *erelong* slew him.
*Spenser on Ireland.*

*Ere* he would have hanged a man for the getting a hundred bastards, he would have paid for the nursing a thousand. *Shakspeare.*

I am as fair now, as I was *erewhile*;
Since night you loved me, yet since night you left me.
*Id.*

Nothing is lasting that is feigned: it will have another face than it had *erelong*. *Ben Jonson.*

Just trial *ere* I merit
My exaltation without change or end. *Milton.*

They swim in joy,
*Erelong* to swim at large, and laugh, for which
The world *erelong* a world of tears must weep.
*Id.*

The anger already began to paint revenge in many colors, *erelong* he had not only gotten pity but pardon. *Sidney.*

We may observe some of our noble countrymen, who come with high advantage, and a worthy character into the public. But *ere* they have long engaged in it, their worth, unhappily becomes venal.
*Shaftesbury.*

Our fruitful Nile
Flowed *ere* the wonted season. *Dryden.*

The mountain trees in distant prospect please,
*Ere* yet the pine descended to the seas;
*Ere* sails were spread new oceans to explore. *Id.*

I saw two stock-doves billing, and *erelong*
Will take the nest. *Id. Virgil.*

Ah, gentle soldiers, some short time allow;
My father has repented him *erenow*. *Id.*

We sit down to our meals, suspect not the intrusion of armed uninvited guests, who *erewhiles*, we know were wont to surprise us. *Decay of Piety.*

It pleases me to think, that I who know so small a portion of the works of the Creator, and with slow and painful steps creep up and down on the surface of this globe, shall *erelong* shoot away with the swiftness of imagination, and trace the springs of nature's operations. *Spectator.*

Nor did the third his conquests long survive,
Dying *ere* scarce he had begun to live.
*Addison's Ovid.*

Had the world eternally been, science had been brought to perfection long *erenow*. *Cheyne.*

The religion which, by this covenant, we engage ourselves to observe, is a work of labour and difficulty; a service that requires our greatest care and attention. *Rogers.*

The birds shal' cease to tune their evening song,
The winds to breathe, the waving woods to move,
And streams to murmur, *ere* I cease to love.
*Pope.*

My fugitive years are all hasting away,
And I must *ere* long lie as lowly as they,
With a turf on my breast, and a stone at my head,
*Ere* another such grove shall arise in its stead.
*Cowper.*

—*Erewhile*, emerging from infernal night,
The bright assurgent rises into light,
Leaves the drear chambers of the insatiate tomb,
And shines and charms with renovated bloom.—
*Darwin.*

The third, a wary, cool old sworder, took
The blows upon his cutlass, and then put
His own well in; so well, *ere* you could look,
His man was floored, and helpless at his foot.
*Byron.*

EREBUS, Ερεβος, from ערב, night, in mythology, a term denoting darkness. According to Hesiod, Erebus was the son of Chaos and Nox, or Night, and the father of Dies, or Day

Erebus was also part of the infernal regions among the ancients. They had a peculiar expiation for those who were detained in Erebus. It was properly the gloomy region, and distinguished both from Tartarus, the place of torment, and Elysium, the region of bliss. According to Virgil's account, it formed the third grand division of the invisible world beyond the Styx, and comprehended several particular districts, as the limbus infantum, or receptacle for infants; the limbus, for those who were put to death without cause; that for those who destroyed themselves; the fields of mourning, full of dark groves and woods, inhabited by those who died for love; and beyond these, an open champaign country for departed warriors.

ERECT', *v. a.*, *v. n.*, & *adj.*
Erect'ed, *part.* & *adj.*
Erec'tion, *n. s.*
Erect'ness.
Fr. *eriger*; Lat. *erigo*; *e* and *rego*, to rule (from Heb. רעה, to feed sheep); to build by rule. To raise up or construct a building: hence to establish, to settle, as well as elevate, lift up, raise or derive logical consequences, animate, encourage.

Great difference there is between their proceedings, who *erect* a new commonwealth which is to have neither regiment nor religion the same that was, and theirs who only reform a decayed state. *Hooker.*

That vigilant and *erect* attention of mind, which in prayer is very necessary, is wasted or dulled. *Id.*

The first thing which moveth them thus to cast up their poison, are certain solemnities usual at the first *erection* of churches. *Id.*

How excellently composed is that mind, which shows a piercing wit, quite void of ostentation, high *erected* thoughts, seated in a heart of courtesy and eloquence, as sweet in the uttering, as slow to come to the uttering. *Sir P. Sidney.*

He suffers seventy-two distinct nations to be *erected* out of the first monarchy under distinct governors. *Raleigh.*

Pillars were set up above one thousand four hundred and twenty-six years before the flood, counting Seth to be an hundred years old at the *erection* of them. *Id. History.*

The trefoil against rain swelleth in the stalk, and so standeth more upright; for by wet, stalks do *erect*, and leaves bow down. *Bacon's Natural History.*

Starting is an apprehension of the thing feared, and in that is a shrinking, and likewise an inquisition what the matter should be; and in that it is a motion of *erection*: so that when a man would listen suddenly he starteth; for the starting is an *erection* of the spirits to attend. *Id.*

(Aaron) makes the graven image of a calf, *erects* an altar, consecrates a day to it, calls it their god, and weeps not to see them dance before it.
*Bp. Hall's Contemplations.*

Two of far nobler shape, *erect* and tall,
Godlike *erect*, with native honour clad
In naked majesty, seemed lords of all,
And worthy seemed; for in their looks divine,
The image of their glorious Maker shone.
*Milton.*

Basil tells us, that the serpent went *erect* like man. *Browne.*

From fallacious foundations and misapprehended mediums, men *erect* conclusions no way inferrible from the premises. *Id. Vulgar Errours.*

We take *erectness* strictly as Galen defines it; they only, sayeth he, have an *erect* figure, whose spine and thighbone are carried on right lines. *Id.*

Why should not hope
As much *erect* our thoughts, as fear deject them?
*Denham.*

Let no vain fear thy generous ardour tame;
But stand *erect*, and sound as loud as fame.
*Glanville.*

Her peerless height my mind to high *erection* draws up. *Sidney.*

Happier walls expect,
Which, wandering long, at last thou shalt *erect*.
*Dryden's Virgil.*

I, who am a party, am not to *erect* myself into a judge. *Id. Fables, Preface.*

I am far from pretending infallibility: that would be to *erect* myself into an apostle. *Locke.*

Malebranche *erects* this proposition, of seeing all things in God, upon their ruin. *Id.*

It must needs have a peculiar influence upon the *erection*, continuance, and dissolution of every society. *South.*

We are to consider only the *erection* of the hills above the ordinary land. *Brerewood on Languages.*

All the little scramblers after fame fall upon him, and have recourse to their own invention rather than suffer him to *erect* himself into an author with impunity. *Addison.*

There are many monuments *erected* to benefactors to the republick. *Id. On Italy.*

Vain were vows,
And plaints and suppliant hands, to Heaven *erect*.
*Philips.*

The trembling stars
See crimes gigantic, stalking through the gloom,

With front *erect* that hide their head by day,
And making night still darker by their deeds.
*Young.*

The same pride thet *erects* a colossus, or a pyramid, instals a god or a hero. *Goldsmith.*

When nature has *erected* no barrier, and affords no retreat, the guilty or obnoxious are soon detected and punished. *Robertson. History of Scotland.*

Erect, in fortification, that state of the defences of a face, when the several works bear directly and regularly upon the approaches. Thus, when the two bastions which defend a curtain are equal and similar, and the raveline, with all its dependencies, stands evenly upon the line or capital of that face, without obliquity or curve, the whole of such defences are said to be erect. The whole of the defences of a fortification will be of this description: as far, of course, as possible, in all irregular fortifications there will generally be a mixture of erect and of oblique defence. And the latter is not always to be considered a defect; since innumerable cases occur in which the prolongation, or the curtailment of any particular part, such, for instance, as the face or flank of a bastion, is indispensably necessary, either to make way for some natural advantage, or to prevent that kind of weakness which might otherwise be entailed by the proximity of some height, whence enfilading might be successfully practised. When, therefore, the two bastions are dissimilar, or when they are unequal, so as to render the flanked angle of either less distant on the capital, if a line of defence were to be drawn upon, and formed from, the two extremities of such unequal bastions, the raveline must either stand a little obliquely, or the bastions must be unequally protected by it.

ERECTORES. See Anatomy.

EREEF, or Rif, a province of Morocco, in the Mediterranean, described by Mr. Jackson as containing 200,000 inhabitants, and abounding in fertile valleys. The mountains to the south are inhabited by Brebers, of a very fierce and courageous character; the eye of an Ereef Breber is proverbial for keenness and cunning.

EREKLEE, a town of Caramania, in Asiatic Turkey, situated on the left bank of the Kalys, in a very fertile and picturesque district. It stands in front of a hill, and is of considerable size, but the houses are mean, being principally constructed of mud, or bricks dried in the sun. The gardens yield abundance of fruit, especially pears. Some have thought this the ancient Heraclea.

EREKLI, Eregri, or Penderachi, a seaport town of Asiatic Turkey, on the Black Sea, 100 miles east of Constantinople.

ER'EMITE, *n. s.* } Lat. *eremita*, from Gr.
Eremit'ical, *adj.* } ἐρημος, a desert. One who secludes himself from society; living in solitude: generally applied to religious devotees of this description.

Antonius, the *eremite*, findeth a fifth commodity not inferior to any of these four. *Raleigh's History.*

Embryoes and idiots, *eremites* and friars,
White, black, and grey, with all their trumpery.
*Milton.*

Thou spirit who led'st this glorious *eremite*
Into the desert his victorious field,
Against the spiritual foe, and broughtest him thence
By proof the undaunted Son of God, inspire. *Id.*

They have multitudes of religious orders, *eremitical*, and cenobitical. *Stillingfleet.*

EREPTATION, *n. s.* Lat. *ereptio.* A creeping forth.

EREPTION, *n. s.* Lat. *ereptio.* A snatching or taking away by force.

ERETHISMUS, from ερεθιζω, to irritate, or excite. A term which some medical writers extend to every kind of irritation which has a tendency to weaken and destroy the vital powers. Mr. Pearson, on succeeding to the situation of surgeon to the Lock, drew the particular notice of medical men to a dangerous affection of the constitution, now well known by the name of the mercurial erethismus. He had occasion to remark, that almost every year one, and sometimes two instances of sudden death occurred among the patients, when no cause could be assigned for these events, but the subjects were commonly observed to be men who had either nearly, or completely finished a course of mercury. Messrs. Bromfield and Williams, on being consulted by Mr. Pearson concerning these cases, confessed themselves ignorant of the cause, mode of prevention, and treatment, and explained, that they had never been able to detect any diseased appearances in the bodies of such persons as had died in this manner. The latter able surgeon at length ascertained, that these unfortunate accidents were to be ascribed to mercury acting as a poison on the system, quite unconnected with its operation as a remedy; and that its deleterious qualities were neither in proportion to the inflammation in the mouth, nor to the actual quantity of mercury absorbed into the constitution. The disordered state of the system, implied by the mercurial erethismus, comes on after a long employment of mercury. According to Mr. Pearson, its tendency to fatal consequences is characterised by great depression of strength, a sense of anxiety about the præcordia, irregular action of the heart, frequent sighing, partial, or universal trembling, a small, quick, and sometimes an intermitting pulse, occasional vomiting, a pale contracted countenance, a sense of coldness; but the tongue is seldom furred, and the vital and natural functions are not much disordered. He further observed that when these, or the greater part of these symptoms are present, a sudden and violent exertion of the animal power will sometimes prove fatal. Walking hastily across the ward; rising up suddenly in the bed to take food; or slightly struggling with some of the other patients, are circumstances noticed by him as having commonly preceded the sudden death of such persons. And in order to avert the perilous effects of this affection, Mr. Pearson states, that the employment of mercury is, at all events, to be discontinued, whatever may be the stage, extent, or violence of the venereal symptoms. Every consideration must yield to the great object of extricating the patient from a state of impending destruction; nor would a perseverance in the use of mercury, under these circumstances, be of any avail, in regard even to the syphilitic complaints.

ERETRIA, in ancient geography, a city of Eubœa, situated on the Euripus, in the southwest of the island, and the largest in it, except

Chalcis. After being demolished by the Persians, it was restored on an adjoining spot, according to Strabo, who mentions a school of Eretrian philosophers there. See ARMIRO.

ERFORT, or ERFURT, a city of Germany, in the late circle of the Lower Rhine, founded in the fifth century. It was long the capital of Thuringia, and subject to the elector of Mentz; but was ceded to Prussia in 1802. It had an ecclesiastical, a civil, and criminal tribunal, and a regency, from which appeals might formerly be made to the elector. The municipality was composed of an equal number of Catholics and Lutherans. The town is large, but not populous; the buildings in general are in the Gothic style. It is situated on the Gera, fortified, and defended by a well-built citadel called Petersberg. Branches of the river traverse the town in the form of canals. It contains a mitred abbey, and seven others, four parish churches, and three chapels for Roman Catholics; eleven churches for Lutherans; an academy for useful sciences; a well furnished library, in which are several manuscript Bibles in the Hebrew character; and had until 1816 a university composed of five colleges, whose professors were Roman Catholics and Lutherans. But it was dissolved in the last named year, for want of funds. After the fatal battle of Jena, a corps of 14,000 Prussians retreated hither, but were obliged to surrender the next day to the French; a park of artillery of 120 pieces fell likewise into the hands of the latter. Two years after, Erfurt was the scene of an interview between the emperors Napoleon and Alexander of Russia; and, in October, 1813, this place became the retreat of the French army from Leipsic. Erfurt is now the capital of an extensive Prussian province, though it is said to have been in the sixteenth century a place of greater population and commerce. The inhabitants, who amount to about 18,000, are employed largely in the manufacture of woollens and silk. The territory of Erfurt is fertile, but wants wood. It contains, besides the capital, two towns, and seventy-three villages. Erfurt is 110 miles west of Dresden, and 160 east of Cologne.

ERGASTULUM, in Roman antiquity, a prison, work-house, or house of correction, where slaves by the private authority of their masters were confined and kept for their offences to hard labor. The Greeks had a place of confinement of this sort, called Σωφρονιστηριον.

ERGOT, *n. s.* A sort of stub, like a piece of soft horn, about the bigness of a chestnut, which is placed behind and below the pastern joint, and is commonly hid under the tuft of the fetlock.—*Farrier's Dictionary.* See below.

Deep-rooted mould, and *ergot's* horn uncouth,
And break the canker's desolating tooth. *Darwin.*

ERGOT, (from ergot, French, the spur of a cock), in agriculture, a vegetable disease which affects various kinds of grain, by the seeds growing out into large black horns. It is particularly seen in sea-cale, rye, and carex. It often attacks the rye in France, and is seen in this country in very moist seasons. The grain yields a black meal along with the white, and is asserted to have the appearance of being pierced or perforated by insects, which are believed by some to be the cause of the affection. The earliest account of this disease of rye is contained in a letter from M. Dodart to the editor of the Journal des Savans, published in March, 1676. See vol. iv. part ii. p. 79. The facts were communicated a few years before by the physicians and surgeons of Sologne, in which district the disease, called by this name (see below), had been prevalent. The grains of rye affected by the ergot, according to M. Dodart, are of a dark color externally, but white within, and when dry they are harder and of a more compact substance than the natural grains, and have no bad taste. They are considerably longer than the other grains, some of them being fourteen or fifteen lines in length, and two in breadth; and seven or eight of them are sometimes seen in one ear. They are obviously not foreign substances engendered between the grains of rye, M. Dodart adds, but the true grains, surrounded with their proper coats, in which the place of the germ is discernible. These grains were called ergots, spurs, in Sologne; in Gastinois, where they also were known, they were termed bled cornu. The disease has also other appellations, such as clavus, or the spur, and horn-seed; and no certain method of treating or preventing it has, we believe, been suggested,

ERGOT, in medicine, a term applied to denote a disease in the human body, occasioned by using diseased or ergoted rye as food.

Writers in general agree in stating that the disease, which the ergoted rye induces, is prevalent only at the conclusion of harvest, and ceases before the commencement of winter; that it is chiefly observed among the poor, who are unable to procure wheaten bread in those seasons.

The symptoms of the ergot in the human body are described somewhat differently by different writers; but they coincide in representing a dry gangrene, and ultimately death, as the ordinary results. It commences with a lassitude and debility, but with little interruption to the functions in general. A degree of torpor in the lower extremities is then observed, accompanied, according to some of the writers, with a sense of prickling, and of the creeping of insects (formicatio) upon the skin; a slight degree of swelling, but without inflammation, ensues, often accompanied by the most excruciating pains, and with a sense of burning heat; soon succeeded by that of extreme cold; the skin of the feet and legs become shrivelled, and of a dark hue, as if dried in smoke, afterwards black and destitute of feeling; in fact the limb dies, or is gangrenous, but in a dry state, which has been compared to that of a mummy. By degrees the dead parts separate from the living, as if they had been destroyed by caustic. In this mutilated condition, deprived of one, sometimes of both legs, more rarely of the hands or arms, some individuals have survived for months, or even years.

Another species of disease has also been ascribed to the use of ergoted rye by Hoffmann, Tissot, and some other writers; but with what justice or propriety may admit of a question. It is a febrile disease, said to be of a contagious and malignant nature, and to be accompanied

and principally characterised by various spasmodic and convulsive symptoms, by which, or by a general epilepsy, the patients were frequently carried off. This disease is said to have been epidemic in Hessia, Westphalia, and other parts of Germany several different times in the sixteenth and seventeenth centuries; and a description of it by the professors of the university of Marpurg, in the year 1597, is generally considered the first authentic account of the symptoms. • Galen remarked, that the seeds of lolium temulentum mixed with wheat, or the degenerated grain, called black wheat, would produce fever, head-ache, delirium, and gangrenous ulcers. (De Aliment. facultat. lib. i. cap. 37.) Most of the writers on the subject, from M. Dodart downwards, have stated, that the ergoted rye, when given to fowls, hogs, and other animals, as food, produces the same symptoms as in man, and destroys life. More lately the abbé Tessier made a series of experiments upon this subject, and has given a minute description of the ergot in rye. He found that by feeding or cramming turkeys and other animals with this diseased rye, he could produce in all of them the dry gangrene and death. See *Memoires de la Soc. Roy. de Medecine* for 1776, p. 303. *Hist. de l'Acad. des Sciences*, for 1710. *Acta Erudit. Lips.* 170 et 1752. *Saviard Obs. Chirurg.* The *Treatise* of M. Tessier, &c.

ERIC X., king of Sweden, Norway, and Denmark, was the son of Wratislaus VII. duke of Pomerania, and one of the few Danish princes who possess particular claims upon our notice. He was declared successor to the crowns of Denmark and Norway in the year 1388 by his great aunt queen Margaret; and when, in 1396, she annexed the crown of Sweden to her dominions, Eric was, by the treaty of the 'Union of Calmar,' declared successor to that kingdom also. This important treaty consisted of three articles: 1. 'That the three kingdoms of Denmark, Sweden, and Norway, should thenceforward have but one king, who should be chosen alternately by each of them, and approved in a general assembly. 2. That the monarch should divide his residence equally between the three kingdoms, and appropriate the revenues of each to its particular exigencies. 3. That each kingdom should retain its own laws, customs, senate, and privileges; and that the subjects of one should not be elevated to offices of profit and power in the other.' These conditions proved afterwards to be the fruitful and lasting source of wars between the three kingdoms. On the death of the queen in 1412, Eric succeeded without opposition to the three united crowns, and having married the daughter of Henry IV. of England, with whom he had a large portion, might be regarded as one of the most potent princes of his day. He was soon involved in a war with the princes of Holstein, which for some time was carried on with doubtful success, but in 1424 the whole of South Jutland, including Sleswick and Gottorp, was ceded to the Danish crown by an award of the emperor Sigismund. Eric now undertook a pilgrimage to the Holy Land, during which he was made captive, and in his absence a rebellion broke out. Having raised the large sum demanded for his ransom, he, in 1435, met the Swedish diet at Stockholm, and agreed to a full redress of grievances. Four years after, however, his people deposed him, and chose in his stead, his nephew Christopher of Bavaria. For ten years he made various unsuccessful attempts to regain his crown, and afterwards employed himself in compiling a history of Denmark from the public registers, containing the period from the commencement of the monarchy to 1288. He died in 1459, in the isle of Rugen. Eric is said to have possessed quick natural parts, and to have been a lover of learning; but was ambitious, despotic, irresolute, and insincere.

Eric XIV., king of Sweden, and son of the celebrated Gustavus Vasa, ascended the throne in 1560, at the age of twenty-seven. He spoke all the modern languages, and was considered an accomplished prince. But he suffered himself to be hurried away by gusts of passion, which so far predominated over his judgment occasionally, that his father once formed the design of excluding him from the throne, and refused to permit him to negociate in person a treaty of marriage with the princess, afterwards queen, Elizabeth, of England. Eric, however, after his accession, determined to obtain an interview with Elizabeth, and set sail with a large fleet and splendid train, but the vessels being overtaken with a storm, were shipwrecked on his own coast, and the project was abandoned. He now sent proposals of marriage to Mary queen of Scotland, and before he could well obtain an answer, solicited from the emperor the hand of the princess of Lorraine, daughter of Christian II. with whom he was enamoured by the description of some of his courtiers. He received from this quarter a favorable reply, but in the mean time he had changed his mind in favor of Elizabeth. His political conduct, being equally capricious, involved him in continual quarrels with his neighbours, and a confederacy was formed against him by Muscovy, Poland, and Denmark. His brother John, who had married Catharine, daughter of the king of Poland, fell under his suspicion, and was driven to an open rupture. That prince was cited to Stockholm, to vindicate his conduct, and, refusing to appear, an army was sent into Finland with orders to seize him and his wife, and to bring them to the capital. Here he was thrown into prison, accompanied by his wife, who voluntarily chose to share his sufferings. It is even said that the king frequently visited his brother, with the design of murdering him, but that on seeing him he felt his heart relent. With tears in his eyes he would sometimes confess the sanguinary design which had prompted his visit, and added, 'I know that the crown of Sweden is intended for you, and I request that, when you are in possession of it, you will pardon my errors.'

His capricious conduct at length destroyed all respect for him in the breast of his subjects; and, disappointed in his matrimonial projects, he entertained a number of concubines, one of whom, a peasant's daughter, gained such an ascendancy over him that he married her; and his ministers and domestics being generally of mean rank, excited the jealousy of the great families. Eric himself entertained a particular hatred of the Stures, an illustrious family, descended from the

ancient regents. He had taken one of them into favor, though he had, on a former occasion, disgraced him. He now sent him in the quality of ambassador to Stralsund, but he became once more the object of his changeable master's abhorrence, who conceived that he was conspiring against his life, and he suborned witnesses to accuse him of treason before the states. An infamous favorite, named Peerson, persuaded Eric to extirpate the family: sentence of death was accordingly pronounced against the whole of its members, together with twenty-six other nobles, who were the alleged accomplices of a conspiracy. But in a public trial, which was afterwards allowed them, the Stures were able to vindicate their cause so completely, that the king himself apologised to them for their detention and long imprisonment: he nevertheless, in a very short time, stabbed Nils Sture with his own hand. When this unfortunate nobleman drew the dagger from his breast, and presented it to the monarch, Eric, with the most savage barbarity, ordered his guards to accomplish that which he had failed to perform. The rest of the prisoners were cruelly murdered at the same time. But no sooner was the bloody scene over than Eric felt intolerable pangs of remorse. He was perfectly frantic, we are told; and, as if pursued by the avenging furies, fled into the woods, where he wandered for many days like a wild beast. On his return he endeavoured to compensate for his cruelty, by bestowing large sums upon the friends and relations of the victims; and by giving up Peerson, who was condemned but not executed. Being now threatened by the king of Denmark, Eric set at liberty prince John, to whom and to his other brother he proposed assigning lands in Livonia, in lieu of those left them by Gustavus. But he shortly after formed a design of putting them to death, and of conciliating the friendship of the czar of Muscovy, by delivering him the wife of John, to whom that prince had once paid his addresses. On his intentions being discovered, the brothers raised forces in their own defenee, when an accommodation was effected; but on Peerson's being given up and put to the torture, he confessed a plot contrived by himself and the king, of pillaging Stockholm, burning part of the ships in the harbour, and proceeding with the rest to Narva. The dukes now felt themselves justified in breaking the treaty, and they finally obliged Eric to capitulate, when he was solemnly deposed by the states, and John elected king in his stead. His children were also declared incapable of succession, and he was condemned to perpetual imprisonment. His keepers were appointed, it is said, from among the relations of those whom he had so cruelly massacred; and they did not fail to subject him to various insults and indignities. After nine years imprisonment, he finished a wretched life in 1578, in consequence, it was supposed, of poison being administered to him by order of his brother.

ERICA, heath, in botany, a genus of the monogynia order, and octandria class of plants; natural order eighteenth, bicornes. The CAL. tetraphyllous: COR. quadrifid: the filaments inserted into the receptacle: antheræ bifid: CAP. quadrilocular. Of this there are 137 species, four of which are natives of Britain. In the Highlands of Scotland this plant is made subservient to a great variety of purposes. The poorer inhabitants make walls for their cottages with alternate layers of heath, and a kind of mortar made of black earth and straw. The woody roots of the heath are placed in the centre; the tops externally and internally. They make their beds of it, by placing the roots downwards; and, the tops only being uppermost, they are sufficiently soft to sleep upon. Cabins are also thatched with it. In the island of Ilay, ale is frequently made by brewing one part of malt and two of the tops of young heath; sometimes adding hops. Boethius relates, that this liquor was much used by the Picts. Woollen cloth boiled in alum-water, and afterwards in a strong decoction of heath tops, comes out of a fine orange color. The stalks and tops will tan leather. Sheep and goats will sometimes eat the tender shoots, but they are not fond of them. Cattle not accustomed to feed on heath, give bloody milk; but they are soon relieved by drinking plentifully of water. Horses will eat the tops. Bees extract a great deal of honey of a reddish hue from the flowers.

One of the most beautiful species of this tribe is E. elegans, elegant erica, a low shrub with short branches growing in every direction. Leaves ternate, but, by those of one whorl being placed directly between those of the next, the whole is neatly arranged in six distinct rows, glaucous, fleshy, acerose, channelled underneath. Flowers terminal, in a compact umbel.

ERICHT, LOCH, a large lake of Scotland, in Perthshire. It is the largest in the county, except Loch Tay, being twenty-four miles in length, though scarcely a mile in breadth. It lies at the head of the district of Rannoch, and extends some miles into the county of Inverness; situated in the midst of the Grampians, and encompassed on all sides by lofty mountains and rugged cliffs of the most tremendous aspect. Near this lake the unfortunate prince Charles Stuart, the chevalier, after his defeat at Culloden, in 1746, was obliged to lurk and wander among the caves and rocks, subjected to want, and exposed to the rigors of an inhospitable climate.

ERICHT, or EROCHT, a river of Perthshire, in the district of Stormont; formed by the union of the Ardle and Black-water or Shee. After a south-east course of thirteen or fourteen miles, it falls into the Isla; but from the rapidity of its course through the valley of Strathmore, in which it frequently overflows its banks, destroying the labor and hope of the farmer, it has been named the Ireful Ericht. Though its banks are in some places low, they are in general steep and rugged; about two miles north from the village of Blairgowrie, they rise at least 200 feet from the bed of the river, and on the west side are formed, for about 700 feet in length, and 220 in height, of perpendicular rock, as smooth as if the tool of the workman had been employed. The botanist and naturalist may here find much gratification. There is a fine natural cascade about a mile below Blairgowrie, called the Keith; and the scenery in general is beautiful and picturesque.

The river abounds with salmon and trout; and is said to afford, for two miles below the Keith, better encouragement for the rod than any other river in the kingdom.

ERIDANUS, the ancient name of the Padus or Po, an appellation ascribed by Pliny to the Greeks; followed in this by Virgil. It rises in mount Vesulus, in the Alpes Cottiæ, and dividing the Cisalpine Gaul into the Cispadana and Transpadana, and swelled on each hand with no inconsiderable rivers from the other Alps and Appenines, falls by seven mouths into the Adriatic.

ERIE, an extensive lake of North America, of an elliptical form, extending south-west and north-east 231 miles; its greatest breadth is sixty-three and a half miles, and in circumference it is 658 miles. Though liable, like the other great lakes of Canada, to severe storms, it has many good harbours, particularly on its northern side. Its greatest depth is between forty and forty-five fathoms, and its bottom generally rocky. It abounds with great variety of fish. Lake Erie receives its waters on the west by the Detroit from Lakes Superior, Michigan, and Huron; and on the north-east communicates ith Lake Ontario by the Niagara. The line of division between the United States and Upper Canada, runs through it. In some places its navigation is rendered dangerous by numerous projections of perpendicular craggy rocks into the water from its north shore for many miles; and its banks and islands on the west are infested with the rattle-snake and other venomous reptiles. Lake Erie is situated between 78½° and 84° long. W., and between 41° and 43° lat. N.

Erie, a town of the United States, in Pennsylvania, situated on the south shore of the lake of this name. It contains about 1000 inhabitants, with a church, court-house, and public prison. The streets are regularly laid out, and eastward of the town is a strong battery, and on the point of the peninsula a large blockhouse, which together defend the harbour. Here is also a dock-yard, with store-houses, wharfs, &c., forming the American naval depôt on the lake.

Erie, Fort, a fort of Upper Canada, on the north coast of Lake Erie, and west bank of the Niagara, twenty-seven miles south by east of Fort Niagara.

ERIGERON, flea-bane, in botany, a genus of the polygamia superflua order, and syngenesia class of plants; natural order forty-ninth, compositæ. The receptacle is naked; the pappus hairy; the florets of the radius are linear, and very narrow. There are five species; of which the most remarkable is,

E. viscosum, the male flea-bane of Theophrastus, and greater flea-bane of Dioscorides. It is a native of the south of France and Italy; and has a perennial root, from which arise many upright stalks near three feet high. The leaves in warm weather sweat out a clammy juice; the flowers are produced single upon pretty long foot-stalks, are of a yellow color, and have an agreeable odor. The plants are easily propagated by seeds; and thrive best in a dry soil and sunny exposure.

ERIGONE, in fabulous history, the daughter of Icarus, died of grief for her father's death was translated into heaven, and made the sign Virgo.

ERINACEUS, the hedge-hog, in zoology, a genus of quadrupeds belonging to the order of feræ, the characters of which are these:—They have two fore teeth in the upper jaw, at a considerable distance from one another, and two in the under jaw, close together; on each side there are five tusks in the upper jaw, and three on each side in the lower; on each side of both jaws are four grinders. The back and sides are covered with strong sharp spines; and all the feet have five toes. The hedge-hog, being possessed of little strength or agility, does not attempt to fly from or assail his enemies; but erects his bristles, and rolls himself up like a ball, exposing no part of his body that is not furnished with sharp weapons of defence; and in this state may be thrown about without any injury. He will not unfold himself, unless thrown into water: the more he is frightened or harassed, the closer he shuts himself up, and frequently discharges his urine, which has a very fetid and loathsome smell. While in this state, most dogs instead of biting him, stand off and bark, not daring to seize him; or, if they attempt it once, their mouths are so hurt by his bristles, that they will not attempt it a second time. Both the male and female are covered with bristles from the head to the tail. The females are in season in spring, and bring forth their young in the beginning of summer. They commonly bring three or four, and sometimes five at a time. The young ones are of a whitish color, and only the points of the bristles appear above the skin. Some zoologists say, it is impossible to tame them; and that the mother and her young have been confined together, and furnished with plenty of provisions; but, instead of nourishing them, she devoured them one after another. Males and females have likewise been kept in one apartment, where they lived but never copulated. Mr. Kerr, however, says, that 'by the Calmucks, this animal is domesticated, and kept in their huts instead of cats.' Hedge-hogs feed upon fallen fruits, some roots, and insects; they are very fond of flesh either raw or roasted. They frequent woods, and live under the trunks of trees, in the chinks of rocks, or under large stones. Some naturalists allege, that they go into gardens, mount the trees, and come down with pears, apples, or plums, stuck upon their bristles. But this is a mistake; although kept in a garden, they never attempt to climb trees, or stick even fallen fruit upon their bristles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go in quest of food during the night. They eat little, and can live very long without nourishment. They do not lay up any store of provisions in harvest, as they sleep all the winter. They lie under the unmerited reproach of sucking cattle and hurting their udders; but the smallness of their mouth renders that impossible. There are six species, viz. 1. E. auritus, the long-eared urchin of Pallas and Gmelin, or Siberian hedge-hog of Pennant, has long oval ears nostrils crested at the edges, and all the manners

of the European. It inhabits Asiatic Russia, near the Volga and Ural, where it is smaller than the European, and beyond lake Baikal, where it is larger. 2. E. ecaudatus, the tanrec of Buffon, and Asiatic hedge-hog of Pennant, is nearly as large as a rabbit, and has a very long slender muzzle, but no tail. It inhabits India and Madagascar, 3. E. Europæus, the European, or common hedge-hog, with broad, short, round ears, and crested nostrils. It is about ten inches long; the upper part of the body is totally covered with sharp spines, and the under part with hair. The hedge-hog, even when standing on his legs, has a very ugly aspect. His body is an oblong mass, convex above, terminated on the fore part by a very sharp muzzle, and mounted on four short legs, of which nothing appears but the feet, and the tail is not discernible. His eyes are small and protuberant. 4. E. inauris, the white American urchin of Seba, or Guiana hedge-hog of Pennant, is eight inches long, and has no external ears. It is a native of South America. 5. E. Malaccensis, the Malacca urchin of Brisson, or short-tailed porcupine of Linnæus, has pendulous ears, and inhabits Asia. From this species is procured the piedra del porco, formerly much esteemed, supposed by Mr. Kerr, to be a kind of bezoar. 6. E. setosus, the tendrac, has spines only on the head, neck, tail, and withers; is scarcely six inches long, and inhabits India and Madagascar.

ERI'NGO, *n. s.* Sea-holly. A plant.

ERINNYS, Gr. εριννυς, i. e. an avenger of crimes, in mythology, a name common to the three Furies. See FURIES.

ERINUS, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order fortieth, personatæ. CAL. pentaphyllous; COR. limb quinquefid and equal, with its lobes emarginated, and the upper lip very short and reflexed; CAP. bilocular. There are seven species, none of them natives of Britain. They grow mostly at the Cape, and are from two inches to four feet in height, and are adorned with flowers of a white or purple color. They are propagated by seeds, but, in this country, require to be kept in a stove.

ERIOCAULON, in botany, a genus of the trigynia order, and triandria class of plants; natural order sixth, ensatæ. CAL. an imbricated capitulum or knob; there are three equal petals, and the stamina are on the germen. There are nine species, natives of India and South America.

ERIOCEPHALUS, in botany, a genus of the polygamia necessaria order, and syngenesia class of plants; natural order forty-ninth, compositæ. Receptacle somewhat villous; no pappus: CAL. decaphyllous and equal; the radius has five florets. Three species, all Cape plants, of an herbaceous kind.

ERIOPHORUM, in botany, a genus of the monogynia order, triandria class of plants. The glumes are paleaceous and imbricated all round: COR. none: SEED one only, furnished with a very long down. Species six, four of which may be found in English bogs.

ERIOSPERMUM, from εριον, wool, and σπερμα, seed, a Cape plant, so called from the long woolly hairs which cover its seed. It belongs to the class and order of hexandria monogynia COR. bell-shaped, permanent, of six ovate, equal keeled petals, three of which are exterior and most expanded. Filaments six, shorter than the corolla, awl-shaped, and dilated at the base smooth; antheræ incumbent, oval, two-lobed Germen superior, ovate, with six ribs; style erect, angular, as long as the stamens; stigma simple, obtuse; CAPS. of three cells and three valves; partitions from the centre of each valve SEEDS several, affixed to the lower part of each partition, roundish, invested with long prominent woolly hairs. Three species, all Cape plants.

ERIOSTEMUM, in botany, a genus of the decandria class, and monogynia order: CAL. five-parted; petals five, sessile; stamens flat ciliate; anthers pedicelled, terminal; style from the base of the germ: CAPS. five in number, and united, seated on a nectary covered with protuberances; SEEDS coated. Species one, an Australasian shrub with alternate leaves and solitary flowers.

ERIPHYLE, in fabulous history, the sister of Adrastus, king of Argos, wife of Amphiaraus, and daughter of Talaus and Lysimache. When her husband concealed himself that he might not accompany the Argives in their expedition against Thebes, where he knew he was to perish, Eriphyle suffered herself to be bribed by Polynices with a golden necklace which had been formerly given to Hermione by the goddess Venus, and she discovered where Amphiaraus was. This treachery of Eriphyle compelled him to go to the war, but, before he departed, he charged his son Alcmæon, to murder his mother as soon as he was informed of his death. Amphiaraus perished in the expedition; and his death was no sooner known than his last injunctions were obeyed, and Eriphyle was murdered by the hands of her son.

ERIS, or ATE, the goddess of discord among the Greeks, the Discordia of the Latins. She was represented, by Aristides, with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her bosom. At the marriage of Peleus and Thetis she threw in the golden apple, whereon was written, 'To the fairest;' which occasioned a contention between the goddesses Juno, Minerva, and Venus, each claiming right to the apple. See PARIS.

ERISICHTHON, in fabulous history, a Thessalian, son of Triops, who derided Ceres and cut down her groves. This impiety irritated the goddess, who afflicted him with continual hunger. He squandered all his possessions to gratify the cravings of his appetite, and at last he devoured his own limbs for want of food. His daughter had the power of transforming herself into whatever animal she pleased, and made use of that artifice to maintain her father, who sold her in the form of one animal, after which she assumed that of another, and returned to him.

ERI'STICAL, *adj.* Gr. ἔρις. Controversial relating to dispute; containing controversies.

ERITHALIS, in botany, a genus of the monogynia order, belonging to the pentandria class plants; and in the natural method ranking with those of which the order was doubtful. The corolla is quinquepartite: the calyx urceolated or bladder-like; the berry decemlocular inferior.

ERITRIA, anciently Erythræ, a town of Asia Minor, in Natolia. Here was a good sea-port formerly, and a spacious harbour; there was also a temple dedicated to Hercules, esteemed one of the finest in Asia. It is thirty-six miles west of Smyrna.

ERIVAN, called also Persian Armenia, an extensive province of Persia, bounded on the north and west by the Mossian Hills, on the south by the river Araxes, and on the east by the districts of Tharabang and Sharadang. It has an excellent climate; but the winter is long, and the surface, which is generally mountainous, is intersected by fertile valleys. But fruit does not succeed well here from the coldness of the climate. Fish and game are plentiful. The principal towns are Erivan and Nacsivan.

Erivan, Irvan, or Irivan, the capital of the foregoing province, is situated on the banks of the river Tergui, which rises from a lake, about seventy miles farther north. The surrounding country is subject to earthquakes, and the water is considered unhealthy. The city, on one side, surmounts a precipice 600 feet high, and is encompassed by a double wall. It is also commanded by a spacious castle built on an almost perpendicular rock, and defended by a triple wall on three sides. Erivan has suffered severely from sieges. In 1635 it was taken from the Turks by the king of Persia, who changed its position to its present site, about a mile from where it formerly stood. The pacha of Diarbekir attacked it in 1724 with a numerous army, of which he lost 24,000 in four unsuccessful attempts to storm, but the inhabitants capitulated after a brave defence. It was taken by Nadir Shah in 1748, and since his time has been in the possession of Persia. In 1808 the Russians blockaded it for six months, and then endeavoured to take it by assault, but they were repulsed with great slaughter.

ERKE, *n. s.* Sax. eaɲᵹ. Idle; lazy; slothful. An old word; whence we now say irksome.

> For men therein would hem delite;
> And of that dede be not *erke*,
> But oft sithes haunt that werke. *Chaucer.*

ERLAF, Great and Little, two rivers of Austria, which rise in the mountains that border on Styria, and fall into the Danube near Pechlarn. They are rapid and unfit for navigation.

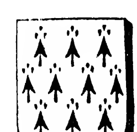
ERLAN, a town, valley, and river, of Hungary, in the county of Hewesch. The town is of very ancient date; and, after being many centuries the see of a bishop, was raised to an archbishopric in 1803. The population, about 15,000, is of German, Hungarian, and Rascian descent. Here are churches for their different religions, and, though the houses are generally mean, the public edifices are respectable, particularly the cathedral and episcopal residence. On a strong and lofty rock stands a citadel which commands the town. Here is an academy, with professors of law, philosophy, and theology. Erlan has suffered formerly in the Turkish war with Germany, and in 1800 was much damaged by fire. It is thirty-eight miles from Baden, and 120 south-east of Vienna.

ERLANGEN, a town of Germany, in Franconia, and former marquisate of Culembach. It is situated on the Regnitz, twelve miles northwest of Nuremberg, and on the high road from Leipsic to Bayreuth. It was founded by Charlemagne, and a new town was added to it by the marquis Christian Ernest, as a refuge for the French protestants, in 1686. It has a university, a palace, and several churches. The population, about 8500, is employed in the manufacture of hats, stockings, and gloves.

ERMENONVILLE, a village in the department de l'Oise, about 8 leagues from Paris; the country seat of M. de Girardin, celebrated for its large and handsome park, in which the remains of Rousseau were entombed upon an island of poplars. French and foreigners, particularly the English, frequently go thither from Paris, during the summer, to visit the tomb of Rousseau. In former days, the fair Gabriele d'Estrées resided at Ermenonville, in a hunting castle, of which a tower, still standing, bears the name of that favorite of Henry IV. After her death, Ermenonville fell into the hands of that faithful friend of Henry, whom grief for the loss of his master carried off two days after the king's assassination by Ravaillac. Ermenonville has been made still more remarkable in later times. J. J. Rousseau died there, after having lived there only six weeks. His bones were removed from the island of poplars to the Pantheon. The ornaments of art contribute to the embellishment of this beautiful spot, so highly favored by nature. The elder de Girardin, author of a work on horticulture, expended 3,000,000 francs on it in 30 years.

ER'MINE, *n. s.*
Er'mined, *adj.*
Er'melin, *n. s.*
Fr. *hermine*, from Lat. *armenius*, because the animal comes from Armenia.—Dr. Johnson. See Mustela. From *armus*, the shoulder, because the capes or shoulders of princes' robes are lined with ermine.—Minsheu. The fur of a species of mustela.

Ermine, or Ermin, in heraldry, denotes a white field or fur, powdered or interspersed with black spots, called powdering. It represents the skin of an animal so named. There is however no animal whose skin naturally corresponds to the herald's ermin. The animal is milk white; and, so far from having spots, that tradition reports, it will rather die or be taken than sully its whiteness; hence its symbolical use. But white skins having for ages been used for the linings of the robes of magistrates and great men, the furriers, to add to their beauty, sewed bits of the black tails of those creatures upon the white skins; which alteration was introduced into heraldry. The sable spots in ermine are not of any determinate number, but may be more or less at the pleasure of the painter or furrier.



Ermine, an order of knights, instituted in 1450 by Francis I., duke of Bretagne, and formerly subsisting in France. The collar was of gold, composed of ears of corn in saltier; at the end of which hung the ermine, with this inscription, 'a ma vie.' But the order expired when the dukedom of Bretagne was annexed to the crown of France.

ERMINE'E, or a cross ermine, is a cross composed of four ermine spots placed crosswise, as in the annexed figure.

ERMINES are white spots on a black field.

ERMINITES is the field white, and the spots black, with one red hair on each side.

ERMINOIS is the field *or*, and the spots black.

ERNE, or EARN, a river of Perthshire, which issues from the lake, about four miles west of Comrie; runs in beautiful meanders for above twenty miles through Stratherne, and falls into the Tay about five miles south-east of Perth. It has a bridge of great antiquity, three miles above its junction with the Tay. The tide flows two miles above this bridge, and sloops of fifty tons come up to it with lime and coals. The bridge is kept in repair by the town of Perth. Salmon, perches, trouts, &c., are found in the Erne.

ERNE LOCH, or LOCH EARN, a lake in the south-west of Perthshire, eight miles long and one broad, which never freezes. Its banks for five miles on each side are covered with natural oaks. It has an artificial island, with the ruins of an ancient castle, at each end.

ERNESTI, John Augustus, founder of a new theological and philosophical school in Germany, was born at Tennstädt, in Thuringia, 1707. He studied theology at Pforta, Wittenberg, and Leipsic. Having been made associate instructer (1731) and rector (1734) of the Thomas-school in Leipsic, he devoted himself principally to ancient literature, and the studies connected with it. In 1742, he was appointed extraordinary professor of ancient literature in the university there, and, in 1756, ordinary professor of eloquence. In 1759, an ordinary professorship of theology was added to his other offices. He performed the duties of both professorships till 1770, when he resigned the former. He became, in succession, first professor of the theological faculty, canon at Misnia, assessor of the consistory at Leipsic, and president of the Jablonowski academy of sciences at Leipsic. He died 1781. By a careful study of profane philology, he had fitted himself for a thorough study of theology, and was thus led to a more judicious exegesis of the biblical writers, and, in general, to more liberal theological views. Theological criticism, so far as it is founded on philology and grammatical illustrations, was greatly promoted by him. Of his accuracy as a critic and grammarian, his editions of Xenophon's *Memorabilia* of Socrates, the Clouds of Aristophanes, Homer's works, Callimachus, Polybius, Suetonius, Tacitus, and, above all, his admirable edition of Cicero's works (first, at Leipsic, 1738), are sufficient proofs. For the elegance of his Latin style, he well deserves to be called the *Cicero of Germany*. His *Opuscular Orat.* (Leyden, 1762), *Oration.* (Leipsic, 1791), *Initia Doctrin. Solidioris* (Leipsic, 1736), have been often published. His theological writings are no less numerous. — ERNESTI, Augustus William, nephew of the preceding, was born 1735, and died 1801. He was professor of philosophy and eloquence, and a distinguished philologist. We are indebted to him, among other works, for a good edition of Livy and Ammianus Marcellinus.

ERODE', *v. a.* } Lat. *erodo*, from *e* and
ERO'SION, *n. s.* } *rodo*, to gnaw. To eat or corrode away.

EROGA'TION, *n. s.* Lat. *erogatio.* The act of giving or bestowing; distribution.

EROSTRATUS, an Ephesian who burnt the famous temple of Diana the same night that Alexander the Great was born. This burning, as some authors observed, was not seen by the goddess of the place, who was then present at the labor of Olympias, and birth of Alexander. See EPHESUS.

EROTIA, a festival in honor of Eros, celebrated by the Thespians every fifth year with sports and games. If any quarrels or seditions had arisen among the people, it was then usual to offer sacrifices and prayers to Eros, that he would totally remove them.

EROUAD, or ERODU, a town in the province of Combetoor, 104 miles south-east from Seringapatam, which has a large mud fort, occupied by a regiment of sepoys. In the time of Hyder Aly, the suburbs contained about 3000 houses, but Tippoo reduced them one-third; and the whole were destroyed during an invasion of the British. It has been since fast recovering. The canal coming by Erouad from the Bhawani River is an excellent work, fifteen Malabar hours' journey in length. The best land about this place lets for £2 7*s.* per acre, says Mr. Hamilton, and the worst at 11*s.* 4*d.* The dry field is from 5*s.* 10*d.* to 1*s.* 6*d.* per acre.

ERPE (Thomas of), or ERPENIUS (Thomas), a celebrated writer, born at Gorcum in Holland, in 1584, and educated at Leyden. Having studied the oriental languages, he travelled into England, France, Italy, and Germany, and every where obtained the esteem of the learned. On his return to Holland, he was made professor of Arabic in the university of Leyden, and died there in 1623. He published many excellent works, which spread his reputation through the learned world. It is said that the king of Morocco admired so greatly the letters Erpinus wrote to him in Arabic, in the name of the United Provinces, that he often read them to those who spoke that language naturally.

ERR, *v. n.*
ERR'ABLE, *adj.*
ERR'ABLENESS, *n. s.*
ERRA'TA,
ERRA'TUM,
ERRO'NEOUS, *adj.*
ERRO'NEOUSLY, *adv.*
ERRO'NEOUSNESS, *n. s.*
ER'ROR.

} Fr. *errer;* Span. and Port. *errar;* Ital. and Lat. *errare;* Gr. *ἐρρειν*, to wander; *ægrè ire*, to go sorrowfully. — Minsheu. — Ainsworth. To stray; ramble; deviate; miss the right way; mistake; conclude falsely: errable is liable to mistake. Errata and erratum, somewhat of technical use, have been transferred from the Latin to express the typographical errors of a book; erratum being the singular, errata plural. Dr. Franklin, however, makes a more general, and very characteristic, use of these terms.

It is a strange thing to behold what gross *errors* and extreme absurdities many (especially of the greater

sort) do commit for want of a friend to tell them of them. *Bacon.*

Thou art far from destroying the innocent with the guilty, and the *erroneous* with the malicious. *King Charles.*

Popularity carries weak minds, and teaches them the safety of *erring* with a multitude. *Bp. Hall's Contemplations*

Possibly the man may *err* in his judgment of circumstances, and therefore let him fear; but because it is not certain he is mistaken, let him not despair. *Taylor's Rule of Holy Living.*

*Error* supports custom, custom countenances *error*: and these two between them would persecute and chace away all truth and solid wisdom out of human life, were it not that God, rather than man, once in many ages, calls together the prudent and religious consels of men, deputed to repress the encroachments, and to work off the inveterate blots and obscurities wrought upon our minds by the subtle insinuations of *error* and custom. *Milton.*

I will not lag behind, nor *err*
The way thou leading. *Id.*

The muses' friend, unto himself severe,
With silent pity looks on all that *err*. *Waller.*

If he meet with faults, beside those that the *errata* take notice of, he will consider the weakness of the author's eyes. *Boyle.*

The phenomenon may be explained by this hypothesis, whereof he demonstrates the truth, together with the *erroneousness* of ours. *Id.*

A storm of strokes, well meant, with fury flies,
And *errs* about their temples, ears, and eyes. *Dryden's Virgil.*

The rains arise, and fires their warmth dispense;
And fixed and *erring* stars dispose their influence. *Id.*

What brought you living to the Stygian state?
Driven by the winds and *errours* of the sea,
Or did you Heaven's superior doom obey? *Dryden.*

He looked like nature's *errour*, as the mind
And body were not of a piece designed,
But made for two, and by mistake in one were joined. *Id.*

*Errour* is a mistake of our judgment giving assent to that which is not true. *Locke.*

An *error* is not the better for being common, nor truth the worse for having lain neglected: and if it were put to the vote any where in the world, I doubt, as things are managed, whether truth would have the majority; at least, whilst the authority of men, and not the examination of things, must be its measure. *Id.*

They roam
*Erroneaus* and disconsolate, themselves
Accusing, and their chiefs improvident
Of military chance. *Philips.*

An *errour* in pleading, or in the process; and the writ, which is brought for remedy of this oversight, is called a writ of *errour*, which lies to redress false judgment given in any court of record. *Cowel.*

We may infer from the *errableness* of our nature the reasonableness of compassion to the seduced. *Decay of Piety.*

Nor has it only been the heat of *erring* persons that has been thus mischievous, but sometimes men of right judgments have too much contributed to the breach. *Id.*

The confirmed prejudices of a thoughtful life, are as hard to change as the confirmed habits of an indolent life: and as some must trifle away age, because they trifled away youth, others must labour on in a maze of *error*, because they have wandered there too long to find their way out. *Bolingbroke.*

This circle, by being placed here, stopped much of the *erroneous* light, which otherwise would have disturbed the vision. *Newton.*

If the vessels, instead of breaking, yield, it subjects the person to all the inconveniences of *erroneous* circulation; that is, when the blood strays into the vessels destined to carry serum or lymph. *Arbuthnot on Aliments.*

He who from the reflected image of the sun in water would conclude of light and heat, could not *err* more grossly. *Cheyne.*

But *errs* not nature from this gracious end,
From burning suns when livid deaths descend. *Pope.*

Unblamed abundance crowned the royal board
What time this done revered her prudent lord;
Who now, so heaven decrees, is doomed to mourn
Bitter constraint! *erroneous* and forlorn. *Pope.*

I could not discover the lenity of this sentence; but conceived it, perhaps *erroneously*, rather to be rigorous than gentle. *Gulliver.*

In spite of dulness, and in spite of wit
If to thyself thou canst thyself acquit;
Rather stand up, assured with conscious pride,
Alone, than *err* with millions on thy side. *Churchill.*

My soul! henceforth in sweetest union join
The two supports of human happiness,
Which some, *erroneous*, think can never meet,
True taste of life, and constant thought of death! *Young.*

It was not fair in me to take this advantage, and this I therefore notice as one of the first *errata* of my life; but the unfairness of it weighed little with me when under the impression of resentment. *Franklin.*

Another *erratum*. *Id.*

Unenlightened reason often *errs*; undirected virtue frequently deviates from the right path. *Robertson's Sermons.*

Truth needed only a fair hearing to be an overmatch for *error*. *Robertson. History of Scotland.*

B. And yet his judgment was not framed amiss;
Its *error*, if it *erred*, was merely this—
He thought the dying hour already come,
And a complete recovery struck him dumb. *Cowper.*

O blessed proficiency! surpassing all
That men *erroneously* their glory call,
The recompense that arts or arms can yield,
The bar, the senate, or the tented field. *Id.*

Attendant nymphs her dulcet mandates hear,
And nurse in fostering arms the tender year,
Plant the young bulb, inhume the living seed,
Prop the weak stem, the *erring* tendril lead. *Darwin.*

There was in him a vital scorn of all:
As if the worst had fallen which could befall,
He stood a stranger in this breathing world,
An *erring* spirit from another hurled. *Byron.*

Error. Mr. Locke reduces the causes of error in philosophy to these four; first, want of proofs; secondly, want of ability to use them; thirdly, want of will to use them; and, fourthly, wrong measures of probability. He observes upon the first of these, that the greatest part of mankind want conveniences and opportunities of making experiments and observations themselves, or of collecting the testimonies of others, being prevented by the necessity of their condition. Upon the second, he observes, that there are many, who, from the state of their condition, might bestow time in collecting proofs, but yet

are not able to carry a train of consequences in their heads, nor weigh exactly the preponderancy of contrary proofs and testimonies, merely from the difference in men's understandings, apprehensions, and reasonings. He remarks, thirdly, that though some have opportunities and leisure enough, and want neither parts, learning, nor other helps, they never come to the knowledge of several truths within their reach, either upon account of their attachment to pleasure or business; or, otherwise, because of their laziness or aversion to study. The fourth cause of error he imputes, 1st, To the practice of taking for principles propositions that are not in themselves certain and evident, but, on the contrary, doubtful and false. 2dly, To received hypotheses. 3dly, To predominant passions or inclinations. And, 4thly, To authority, or the giving up our assent to the common received opinions either of our friends or party, neighbours or country.

ERROR LOCI, i.e. error of place, a term introduced into medicine by Boerhaave, from the opinion that the vessels were of different sizes for the circulation of blood, serum, and lymph; and that when the larger sized globules were forced into the lesser vessels by an error of place, they were obstructed. This opinion is now exploded.

ER'RAND, *n. s.* Sax ærend; Dan. *arend*; Icel. *erende*, from Goth. *airus*, a messenger. Lye. From Goth. *ara*, to send. Thomson. A mandate or message. Now principally of colloquial use.

When he came, behold the captains of the host were sitting, and he said, I have an *errand* to thee, O captain. *Kings.*

Servants being commanded to go, shall stand still, 'till they have their *errand* warranted unto them. *Hooker.*

But hast thou done thy *errand* to Baptista?
—I told him that your father was in Venice. *Shakspeare.*

A quean! have I not forbid her my house?
She comes of *errands*, does she? *Id.*

I had not taught thee then the alphabet
Of flowers, how they, devisefully being set
And bound up, might, with speechless secrecy,
Deliver *errands* mutely and mutually. *Donne.*

From them I go
This uncouth *errand* sole.
*Milton's Paradise Lost.*

His eyes,
That run thro' all the heavens, or down to the earth
Bear his swift *errands*, over moist and dry,
O'er sea and land. *Id.*

Well thou doest to hide from common sight
Thy close intrigues, too bad to bear the light;
Nor doubt I, but the silver-footed dame,
Tripping from sea, on such an *errand* came.
*Dryden.*

ER'RANT, *adj.*
ER'RANTRY, *n. s.*
ERRAT'IC, *adj.*
ERRAT'ICALLY, *adv.*
From Lat. *erro*; Gr. *ερρω*, to wander. See ERR. Roving, wandering: applied in the middle ages to an order of knights much celebrated in romances: in law, itinerant; in a general sense, deviating from a particular course: and hence vile, extremely bad or abandoned; erratic is irregular, uncertain, without rule or order.

ERRHINES, in pharmacy, medicines which, when snuffed up the nose, promote a discharge of mucus. These are more friendly to the constitution and nerves than sternutatories, by their subtile, acrid, and volatile salt gently stimulating the pituitary membrane, and drawing the mucid humor from it. They are also much safer. Those prepared of cephalic herbs are of singular service in oppressive pains of the head, hemicrania, lethargic disorders, stuffings of the head, and coryza, mucous defluxions of the eyes, drowsiness, vertigoes, and in cases where the malignant humors generated by the lues venerea are lodged in the membranes of the nostrils.

ERRHINES, MILD, are marjoram, basilicon, thyme, hyssop, savory, marum Syriacum, the tops of origanum, flowers of lilies of the valley, and gum benzoin, the resin of guaiacum, fine raspings of aloes wood, dry volatile salt of sal ammoniac perfumed with oil of marjoram, and white vitriol.

ERRHINES, VIOLENT, are euphorbium, the powder of white hellebore, several sorts of snuffs, precipitate mercury, turbith mineral, and pepper.

ERSCH, John Samuel; the father of modern German bibliography. He was born at Gross-glogau, in Lower Silesia, June 23rd, 1766, and, while a mere tyro, showed uncommon love for bibliography. Being encouraged in this pursuit by Tabri and other learned men, he published the Repertory of the German Journals, and other Periodical Collections of Information on the Subjects of Geography, History, and Sciences connected with them, 1790—1792, 3 vols. Becoming known to Schutz and Hufeland, they engaged him in the editing of their Universal Repertory of Literature, 1785—1790. This work was published in 1793, and was followed in 1799 by the *Quinquennium*, extending from 1791 to 1795; and in 1806, by another, extending from 1796 to 1800. These works contain notices of all the separate publications which appeared during that period, and even all the essays printed in the journals and other periodicals. They are executed with accuracy, on a good plan, and with a general account of reviews, whose character for partiality or impartiality is illustrated by examples. At the same time, Ersch began to prepare a Universal Dictionary of Modern Authors, which he afterwards limited to European writers. This was the origin of his *Gelehrtes Frankreich* (Literary France), Hamburg, 1797—1806, 3 vols., with two supplements. In the year 1803, he was made professor of geography and statistics in the university of Halle, where he published his Manual of German Literature, from the Middle of the 18th Century till the latest Times (Amsterdam and Leipsic, 1812, 2 vols. 8vo., 2nd edition, Leipsic, 1822), and the Universal Encyclopædia of Arts and Sciences (Leipsic, 1818, 4to): 16 parts had appeared in 1827. By the former work, he first gave a systematic character to modern German bibliography; and its completeness, accuracy, and arrangement, make it a model for such a work.

ERSKINE is a Scottish family name whose honors have been well upheld in modern times (see our next article). It was settled at a very

remote period at Erskine Castle, in a parish of that name, in Renfrewshire, at the mouth of the Clyde.

We extract the following particulars of its history, furnished by a distinguished member of this family, to a modern periodical work.

The families of Erskine lord Erskine, Erskine earls of Marre, of Buchan and of Kelly, and the lords Cardross of Dryburgh; of Erskine of Dun, Pittodrie, Kinnoul, Kirkbuddo, Balgonie, Shieldfield, and their various branches, are all sprung from this family, situated beyond record at Erskine, to which topographers and antiquaries suppose it gave its name. In the old language of the country, the name being descriptive, not local, signifies 'the man with the dagger,' or 'dagger-man.' The Erskines and the Stuarts were neighbours, and fostered each other's children, till the political extinction of both families in the beginning of the eighteenth century. Passing over the celebrated Dagger-man, who, by his military prowess, first acquired, it is said, the surname of Eris-Skyne from king Malcolm II., the brave Sir William Erskine merits our particular notice, who was knighted in the field, under the banner of king Robert Bruce, for his gallantry under Randolph earl of Murray and the Douglas in England. His son, Sir Robert, lord chamberlain of Scotland, was one of the plenipotentiaries for the redemption of king David II.; governor of the three great fortresses of Scotland, Edinburgh, Dumbarton, and Stirling; and was highly instrumental in the peaceable accession of the Stuarts to the throne of the Scots, in the person of king Robert II. Sir Robert died in the end of 1385. John, the twelfth lord Erskine, and fifth earl of Marre of the name, custodiar of king James V. and his daughter Mary, ambassador in England in 1534, who went with James to France, where he married Magdalen of Valois daughter of Francis I., appears from the history of those times to have been a man of great prudence and virtue, and a friend to the dawning Reformation. His son John, regent of Scotland after the expulsion of Mary Stuart from the throne, though a man of mild character, and unfit for the turbulent age in which he swayed a sceptre, is characterised by all the Scots historians, as a man of untainted virtue; a friend to rational religion, liberty, and learning; the protector and friend of George Buchanan. John, son of the regent, was lord high treasurer of Scotland, knight of the garter, and ambassador in England, before the accession of James VI. to the throne; to which, by his prudence, and by engaging the Cecils, and other principal families, to support the Scots succession, he greatly contributed. He was supplanted in the king's confidence by the worthless favorite Carr, afterwards earl of Somerset, and retired to his seat at Alloa, where he lived to a great age in the enjoyment of an honorable retreat. Inspired with a passion for a daughter of Esme, duke of Lennox, a kinswoman of the king, and his suit meeting with obstruction, he became uneasy and wrote to the king. The king's answer was laconic:—'Cod's fish, Marre, thou sha'nnae die for onie lass in a' the laund.' Sir Alexander Erskine of Gogar, brother to the regent, appears to have been a faithful custodiar of the king, after the death of that distinguished member of the family.

Of the sons of the treasurer, William, the youngest, cup-bearer to the king, was a man of considerable learning. He was in strict habits of literary intimacy with Sir Robert Moray, first president of the Royal Society; with lord Brouncker, and most of the groupe who met together at Oxford, and in Gresham College, during the civil wars. He lived to a great age, and was called Cousin William, by the successive princes of the house of Stuart. William's sister, the countess of Mareschal, was a woman of learning and taste, to whom Arthur Johnston addressed some of his pieces of Latin poetry, and his version of the Psalms. David, lord Cardross, grandson of the treasurer Marre, was remarkable for his love of a free government; but still more for his integrity and sense of honor. He headed the protest against the delivery of Charles I., to the army of the English parliament, saying that 'Evil ought not to be done in expectation of good coming of it.' Lord Innerpesser, one of the Scots judges afterwards, a brother of the famous Fletcher of Saltoun, followed the example of Cardross. Henry, lord Cardross, the son of David, was a friend of Sidney, Russel, and the other patriots, who opposed the arbitrary measures of Charles II. He was forced for a time to take refuge in America; where he founded a small colony in Carolina. When he returned from thence, he came over from Holland with king William III. He was a man of courage, learning, and remarkable attachment to the cause of liberty; but his health being broken by a long imprisonment in Edinburgh Castle, and by his American fatigues, he died in 1693, in the forty-third year of his age. The seal of his colony of Cardross, in Carolina, was accidentally found by the soldiers of general Abercromby, where it had been hastily buried; and was presented by David Stuart, earl of Buchan, his heir, to the state of South Carolina, by the hands of Moultry, the governor of that state, in 1795.

Charles Erskine of Alva, second son of Sir John Erskine of Alva, great-grandson of the treasurer Marre, was a lawyer of considerable eminence in Scotland; and some time lord justice clerk. His second son, Charles Erskine, was a barrister of reputation in England, of the standing of Yorke, after lord chancellor, and Pratt, and was thought, both by the bench and the bar, to be on the fair road to the head of his profession, when, by an access of fever, in the absence of his attendants, he flung himself from a chamber window in Lincoln's Inn. John Erskine, advocate at Edinburgh, and professor of the municipal laws of Scotland, in that college, was a grandson of David lord Cardross. His Institutes of the law of Scotland do him great honor. It has been long a standard book, like Coke's in England.

In the other branches of the family, Thomas earl of Kelly, K. G., was famous for the part he took in the mysterious business of Gowrie's murder at Perth. Of his descendants, Thomas, the seventh earl of Kelly, was a man of uncommon wit and humor, which he seemed to inherit from his mother, who was a daughter of the

celebrated Dr. Pitcairn, and possessed considerable musical taste. Of the Cambo branch of the Kelly family, Charles Erskine, the son of Colin Erskine (who was an eminent painter at Rome, and married a Roman lady), rose by his merit at the bar to a conspicuous situation in the papal states. He was domestic prelate to the pope, and one of the rota on a scale of the highest preferments, overturned by the Revolution at Rome in 1798.

Of the family of Erskine of Dun, John, the reformer in the reign of Mary, was eminent, and a man of great reputation. Of Kirkbuddo, a branch of this family, was Sir Alexander Erskine, ambassador from Sweden at the treaty of Westphalia Of Shieldfield, descended from a natural son of the elder brother of the regent, Ebenezer and Ralph Erskines, the early seceders of Scotland; both men of considerable genius and energy. The former, born 1680, became minister of Portmoak in Fife, in 1702; in which situation he continued six and twenty years, when he removed to Stirling. Five volumes of his sermons are extant, printed 1762 and 1765, 8vo. Differing with the members of the kirk, he joined the sect known by the name of Burghers, and died in 1755.—His brother, Ralph, who was two years younger than himself, was minister of Dumfermline in Fifeshire from 1711 to 1734, when he was ejected by the synod for secession. His sermons are numerous, and, together with a controversial treatise, and some lyrical effusions on sacred subjects, called Gospel Sonnets, fill two folio volumes, printed in 1760. He died in 1751. Robert Erskine, a grandson of Ralph the preacher, was lately a civil engineer both in Britain and the United States of America.

Erskine (Thomas, lord), a celebrated modern lawyer and politician, was the youngest son of David Henry Erskine, earl of Buchan; and designed originally, the family being in contracted circumstances, for a profession. After receiving his education at the High School, Edinburgh, and at the university of St. Andrew's, Aberdeen, he entered at Leith as a midshipman on board a vessel commanded by Sir John Lindsey. He continued in the navy, though without obtaining a commission, four years. In 1768 he entered the Royals, or first regiment of foot; and marrying two years afterwards Frances, daughter of Daniel Moore, Esq., went with his regiment to Minorca, where he spent three years. He was connected with the army about six years; at the end of which, the persuasions of his family, and particularly of his mother, lady Buchan, a woman of very superior mind, induced him to relinquish it, with a view to practise at the bar.

In 1777 he entered as a fellow-commoner at Trinity College, Cambridge, to obtain a degree, and, thereby to shorten his period of probation as a barrister; and entered himself at the same time a student of Lincoln's Inn. He likewise became a pupil in the office of Mr., afterwards judge Buller, then a special pleader, and subsequently in that of Mr., afterwards baron Wood. Being called to the bar the following year, his success was marked and rapid. The first cause in which he was engaged was in defence of captain Baillie, who, being dismissed from a situation in Greenwich Hospital, by lord Sandwich, had become the object of a state prosecution for libel. The conduct of Mr. Erskine gave such satisfaction on this occasion, that he is said to have received thirty briefs immediately from the solicitors who were present, and was retained as counsel for Carnan the bookseller, to resist, at the bar of the house of commons, the claim of the Stationers Company, and two universities, to the sole right of printing almanacs. His next important engagement was that of conducting the defence of admiral Keppel at Portsmouth, for which he was rewarded with 1000 guineas. In 1781 he advocated the cause of lord George Gordon, who was indicted in the court of king's bench for being the promoter of the memorable riots of that period. The ability displayed by him on this trial procured him a silk gown, at the recommendation, it is said, of lord Mansfield. In this same year (1783) he was chosen member of the house of commons for Portsmouth. Soon after he defended the dean of St. Asaph at Shrewsbury, on a charge of libel; and had on the trial a remarkable dispute with his old preceptor, Mr. justice Buller, to whom he ventured to reply upon a point of practice, in so lofty a tone of defiance, that the judge was evidently abashed. In 1789 Mr. Erskine had another opportunity of displaying his peculiar eloquence, in the defence of Mr. Stockdale, the bookseller, for publishing a pamphlet, charged as a libel, in favor of Mr. Hastings. But in 1792, being retained to defend Thomas Paine, on a prosecution for publishing the second part of the Rights of Man, he offended several of his political and personal friends in so doing, and lost his office of attorney-general to the prince of Wales. Perhaps the most arduous effort of his professional life arose out of his situation as counsel on the trials of Hardy, Tooke, and others, for high treason, in 1794. These trials lasted for several weeks, and attracted the attention of the whole country. Mr. Horne Tooke, it is well known, largely assisted in conducting his own defence; a circumstance, which, while it displayed his unquestionable talents, added in no small degree to the onerous task of his leading counsel. All parties, however, joined in admiring the able and constitutional conduct of Mr. Erskine.

His first appearance as an author was not less flattering to this great man, than his first reception at the bar. A pamphlet, in which he warmly expressed his disapprobation of the war with France, passed through upwards of forty editions in a few weeks. In 1802 he was restored by the prince of Wales to his office of attorney-general, and made also keeper of the seals for the duchy of Cornwall. Four years after, lord Grenville, on receiving his late majesty's commands to form an administration, included the name of Mr. Erskine amongst its most efficient members. He was in 1806 created a peer, by the title of lord Erskine, of Restormel Castle, in Cornwall, and raised to the dignity of lord high chancellor of Great Britain; but held the seals too short a period to afford any fair opportunity of estimating his talents for this important trust. It is to be remarked, that he had never practised in the court over which he was called so suddenly to

preside; and that no elevation to a high legal office was ever more decidedly political. The result was, that he distinguished himself rather for the despatch of business, than for the legal solidity of his decisions. The public career of lord Erskine closed with the retirement of his party from power: for though he afterwards occasionally spoke in the house of peers, his parliamentary eloquence was not calculated at this or any other period to increase his fame. On the accession of his present majesty to the regency, he conferred the Order of the Thistle on this old servant and friend.

In his latter years lord Erskine embarrassed his fortune by a speculation in land, and embittered his retirement by a low marriage. In the autumn of 1823 he was seized, while on a voyage to Scotland, with inflammation in the chest; a complaint to which he had been subject for some years, and landing in Yorkshire, reached his nephew's seat at Ammondell, to terminate his earthly probation. He died here on the 17th of November, and was interred in the ancient family vault of the house of Buchan at Uphall. By his first wife, who died in 1805, lord Erskine had five daughters and three sons. By his second, from whom he endeavoured to get divorced, but failed in the object, two sons, we believe. Lord Erskine, it is well known, was a decided whig, and a close adherent of Mr. Fox, whose speeches he edited. Five volumes of his own speeches have been published by Mr. Ridgway. In 1797 he published the tract we have alluded to, entitled A View of the Causes and Consequences of the War with France; and subsequently, poems, a political romance called Armata, and a pamphlet in favor of the Greeks.

Erskine (Henry), elder brother of the preceding, was born at Edinburgh, November 1st, 1746. Being called to the bar in 1768, he was soon admitted a member of the Faculty of Advocates, where he raised himself to high distinction. In 1783 he held for a short time the high official situation of lord advocate of Scotland, and became afterwards dean of the Faculty of Advocates. In 1806 he was re-appointed to the situation of lord advocate, but retired again at the period in which his brother was deprived of the great seal of England. Mr. Henry Erskine was a man of brilliant wit, and wrote several epigrams of merit. He died at his seat of Ammondell in West Lothian, October 8th, 1817.

ERST, *adv.* Sax. æɼꞅꞇa; Teut. *erst;* the superlative of æɼ, thus æɼ, æɼeɼ, æɼꞅꞇa. Foremost, first; at first; at a former time; before; until then or now.

> *Erst* wer you father, and now must ye supply,
> The mothers part also, for lo now here I ly.
> *Sir T. More.*

> In short space they did to health restore
> The man that would not live, but *erst* lay at death's dore. *Spenser. Faerie Queene.*

> Sir knight, if knight thou be,
> Abandon this forestalled place at *erst*,
> For fear of further arm, I counsel thee. *Id.*

> The Rhodians, who *erst* thought themselves at great quiet, were now overtaken with a sudden mischief.
> *Knolles.*

> As signal now in low dejected state
> As *erst* in highest, behold him.
> *Milton's Agonistes.*

> Fame that her high worth to raise,
> Seemed *erst* so lavish and profuse,
> We may justly now accuse
> Of detraction from her praise. *Id.*

> Opener mine eyes,
> Dim *erst*; dilated spirits, ampler heart. *Id.*

> The future few or more, howe'er they be,
> Were destined *erst*, nor can by fate's decree
> Be now cut off. *Prior.*

> He taught us *erst* the heifer's tale to view.
> *Gay.*

> Surprised, alas! to find
> Man now their foe, whom *erst* they deemed their lord,
> But mild and gentle, and by whom as yet
> Secure they grazed. *Somervile*

> And clustering stars, portrayed on mimic spheres,
> Assumed the forms of lions, bulls, and bears;
> —So *erst*, as Egypt's rude designs explain,
> Rose young Dione from the shoreless main.
> *Darwin.*

ERT Holmer, the collective name of a group of four rocky islands of the Baltic, on the north-east of the coast of Bornholm, and subject to Denmark. Two only, Christians-œ and Fredericksholm, are inhabited, and between them is a safe harbour of about 900 feet in length and 200 wide, where vessels navigating the Baltic often put in. There is here a light-house, elevated ninety-two feet above the level of the sea, so that it may be distinguished from that of Bornholm, which is much higher. Here also are batteries and towers, which, when adequately garrisoned, are capable of a long defence. The population, however, is only 450. The whole of these islands are surrounded with rocks and sand-banks. Long. 14° 47′ E., lat. 55° 13′ N.

ERUCA, the general name of caterpillars of all kinds. The caterpillar state is that through which every butterfly must pass before it arrives at its perfection and beauty; no other insects being produced in their winged form. The change from caterpillar to butterfly was long esteemed a metamorphosis, a real change of one animal into another; but this is not the case. The egg of a butterfly produces a butterfly, with all the lineaments of its parent; only these are not disclosed at first, but for the greater part of the animal's life are covered with a case or muscular coat, in which are legs for walking, which only suit it in this state; but its mouth takes in nourishment, which is conveyed to the included animal; and, after a proper time, this covering is thrown off, and the butterfly, which all the while might be discovered in it by an accurate observer with the help of a microscope, appears in its proper form. Before it passes into this state, however, there requires a state of rest for the wings to harden, and the other parts to acquire their proper firmness; this is transacted in a time of perfect rest, when the animal lies in what is called the nymph or chrysalis state, in appearance only a lump of inanimate matter. There is a determined time for each of these changes in every species; but, in the several different kinds, the periods are very different. There is no sign of sex in the animal while in the caterpillar state: the propagation of the species is the business of the crea-

ture in its ultimate perfection; and till that, these parts are never excluded: one female butterfly, when she has been impregnated by the male, will produce 300 or 400 eggs, or even more. See ENTOMOLOGY.

ERUCT', *v. a.* } Fr. *eructation;* Latin ERUCTA'TION, *n. s.* } *eructo*, to belch, vomit forth; the substantive is sometimes used for any sudden burst or eruption of matter or wind.

The signs of the functions of the stomach being depraved, are *eructations*, either with the taste of the aliment, acid, inodorous, or fetid. *Arbuthnot.*

Thermæ, are hot springs, or fiery *eructations;* such as burst forth of the earth during earthquakes. *Woodward.*

ER'UDITE, *adj.* } Fr. *erudition;* Span. ERUDI'TION, *n. s.* } *erudicion;* Ital. *eruditione;* Lat. *eruditio, erudio* to teach, from *rudis* a rod, an important assistant in the mystery of teaching in all ages (Mason has observed that it often conveys a sneer). Learned: a word of modern appearance in our language.

Famed by thy tutor, and thy parts of nature;
Thrice famed beyond all *erudition.* *Shakspeare.*

The earl was of good *erudition*, having been placed at study in Cambridge very young. *Wotton.*

To your experience in state affairs you have also joined no vulgar *erudition*, which all your modesty is not able to conceal; for to understand critically the delicacies of Horace, is a height to which few of our noblemen have arrived. *Dryden.*

Some gentlemen, abounding in their university *erudition*, fill their sermons with philosophical terms. *Swift.*

All or most of these inconveniences, may be avoided at an English university, provided a youth have a discreet tutor, and be himself of a sober and studious disposition. There classical *erudition* receives all the attentions and honours it can claim. *Beattie.*

ERUGINOUS, *adj.* Fr. *ĕrugineux;* Lat. *æruginosus*, from *ærugo* brass rust, from *æs æris* brass. Copper-like: partaking of the nature, substance, or appearance of that metal.

Copperas is a rough and acrimonious kind of salt, drawn out of ferrous and *eruginous* earths, partaking chiefly of iron and copper; the blue of copper, the green of iron. *Browne.*

Agues depend upon a corrupt incinerated melancholy, or upon an adust stibial or *eruginous* sulphur. *Harvey.*

ERUP'TION, *n. s.* } Fr. *eruption;* Spanish ERUP'TIVE, *adj.* } *erupcion;* Ital. *erottione;* Lat. *eruptio; erumpo, eruptus* (from *e* and *rumpo* to break), to break or burst forth. The act of breaking or bursting from confinement; hostile incursion; violent exclamation; cutaneous humor.

Diseased nature oftentimes breaks forth
In strange *eruptions.* *Shakspeare. Henry IV.*

In part of Media there are *eruptions* of flames out of plains. *Bacon's Natural History.*

To his secretary whom he laid in a pallet near him for natural ventilation of his thoughts, he would, in the absence of all other ears and eyes, break out into bitter and passionate *eruptions.* *Wotton's Life of Buckingham.*

It did not run out in voice or indecent *eruptions*, but filled the soul, as God the universe, silently and without noise. *South.*

Such command we had,
To see that none thence issued forth a spy,
Or enemy, while God was in his work;
Lest he, incensed at such *eruption* bold,
Destruction with creation might have mixed. *Milton.*

Finding themselves pent in by the exterior earth, they pressed with violence against that arch, to make it yield and give way to their dilatation and *eruption.* *Burnet's Theory.*

An *eruption* of humours, in any part, is not cured merely by outward applications, but by alterative medicines. *Government of the Tongue.*

Upon a signal given the *eruption* began; fire and smoak, mixed with several unusual prodigies and figures, made their appearance. *Addison's Guardian.*

'Tis listening fear, and dumb amazement all,
When to the startled eye the sudden glance
Appears far south *eruptive* through the cloud. *Thomson.*

At the destined hour,
By the loud trumpet summoned to the charge,
See all the formidable sons of fire,
*Eruptions*, earthquakes, comets, lightnings play
Their various engines. *Young.*

ERVUM, the lentil; a genus of the decandria order, and diadelphia class of plants; natural order thirty-second, papilionaceæ: CAL. quinquepartite, length of the corolla: stigma capitate. There are three species; of which the most remarkable are the following:

1. E. Gallicum, the French lentil, is twice the size of the common lentil, both in plant and seed; and is much better worth cultivation. It should be sown in March, after a single ploughing, in the ground that bore corn the year before. Manure is not absolutely necessary, though it will undoubtedly increase the crop. Its grass is said to be very copious; it may be mowed many times in the year, and affords a healthy as well as an agreeable food to horses, cows, and sheep: the milk of cows fed with it is said to be copious and good. Long and numerous pods ripen about the beginning of winter, which afford a new kind of legume, to be eaten as common lentils; when fresh, it makes admirable peas soup; dry, it is greedily eaten by the poultry. The dried herb is also a good resource for cattle in winter. It is cultivated in Britain, and grows on any kind of ground.

2. E. lens, the common lentil, is cultivated in many parts of England, either as fodder for cattle, or for the seeds which are used in meagre soups. It is an annual plant, and rises with weak stalks about eighteen inches high, garnished with winged leaves composed of several pairs of narrow lobes, terminated by a clasper or tendril, which fastens to any neighbouring plant, and is thereby supported: the flowers come out three or four together, upon short footstalks from the sides of the branches. They are small, of a pale purple color, and are succeeded by short flat pods, containing two or three seeds, which are flat, round, and a little convex in the middle. The seeds of this plant are most commonly sown in March, where the land is dry; but, in moist ground, the best time is April. The usual quantity of seed allowed for an acre of land is from one bushel and a half to two bushels. If these are sown in drills in the same manner as peas, they will succeed better than

when sown in broad-cast: the drills should be a foot and a half asunder, to allow room for the Dutch hoe to clean the ground between them; for, if the weeds are permitted to grow among them, they will get above the lentils and starve them.

ERYCINA, a title of Venus. See ERYX.

ERYMANTHUS, in ancient geography, a mountain, and town of Arcadia, where Hercules is said to have killed a prodigious boar, which he carried on his shoulders to Eurystheus; who was so terrified at the sight, that he hid himself in a brazen vessel.

ERYNGIUM, ERYNGO, or sea-holly, a genus of the digynia order, pentandria class of plants: order forty-fifth, umbellatæ. The flowers are collected into a round head, and the receptacle is paleaceous. There are eleven species, most of which are hardy herbaceous perennials, producing erect stalks from one to two or three feet high; with simple, entire, or divided prickly leaves; and the stalks terminated by roundish aggregate heads of quinquepetalous flowers, of white, blue, or purple colors. They all flower mostly in July, and the seeds ripen in September. They are propagated by seeds sown in a bed or border, either in spring or autumn. The plants are to be removed the autumn after they come up, into those places where they are designed to remain.

E. maritimum grows naturally on the sea-coasts of England and Scotland. The leaves are sweetish, with a light aromatic warmth and pungency. The roots are accounted aphrodisiac, and are kept candied in the shops. The young flowering shoots eaten like asparagus are very grateful and nourishing.

ERYSIMUM, hedge-mustard, a genus of the siliquosa order, and tetradynamia class of plants: natural order thirty-ninth, siliquosæ. The SILIQUA is long, linear, and exactly tetragonal: CAL. close. There are fourteen species; of which the most remarkable is

E. officinale, hedge-mustard, or bank cresses. It grows naturally in Britain under walls, by the sides of highways, and among rubbish. It is warm and acrid to the taste; and, when cultivated, is used as a vernal pot-herb. Birds are fond of the seeds; sheep and goats eat the herb; cows, horses, and swine refuse it. The seeds are said to promote expectoration, and excite urine and the other fluid secretions, and to attenuate and dissolve viscid juices, &c., by an acrimonious stimulating quality; but the taste discovers in them only an herbaceous softness void of acrimony: the seeds indeed are considerably pungent, and the roots in a small degree.

ERYSIPELAS, *n. s.* Gr. ερυσιπελας.

An *erysipelas* is generated by a hot serum in the blood, and affects the superficies of the skin with a shining pale red, and citron colour, without pulsation or circumscribed tumour, spreading from one place to another. *Wiseman's Surgery.*

ERYSIPELAS. See MEDICINE.

ERYTHEA, or ERYTHIA, an island said to have been either adjoining to, or a part of Gades; but nowhere now to be found by the description given of it by ancient authors. The poets feign this to have been the habitation of the fabulous Geryon, disarmed by Hercules, who drove away his cattle.

ERYTHRÆ, in ancient geography, three towns: 1. in Ætolia, on the Corinthian bay: 2. in Bœotia, near Platæa, and mount Cithæron: 3. in Ionia, on the peninsula, at its extremity: with 4. a cognominal port. It was famous for an ancient temple of Hercules.

ERYTHRÆUM MARE, erroneously called Rubrum, or the Red Sea, by the Romans. Thus, the ocean that washes Arabia and Persia, and extends a great way further, is denominated. Hence Herodotus says, that the Euphrates and Tigris fall into the Mare Erythræum. He also calls it the South Sea, on which the Persians dwell. It takes its name, not from its color, the error of the Romans, but from

ERYTHRAS, the son of Perseus and Andromeda, whose kingdom lay on the confines of that sea.

ERYTHRINA, coral tree, a genus of the decandria order, and diadelphia class of plants: natural order thirty-second, papilionaceæ: CAL. bilabiate, the one lip above, the other below; COR. vexillum very long and lanceolated. There are twelve species, all of them shrubby flowering exotics for the stove, adorned chiefly with trifoliate leaves, and scarlet spikes of papilionaceous flowers. They are all natives of the warm parts of Africa and America; and must always be kept in pots, which remain constantly in stoves in this country. They are propagated by seeds annually imported from Africa and America. They are sown half an inch deep in pots of light rich earth, which are then plunged in the bark-bed of the stove; and, when the plants are two inches high, they are separated into small pots, plunged in the bark-bed, with frequent waterings, and as they increase the growth shifted into larger pots. The inhabitants of Malabar make sheaths of the wood, for swords and knives. They use the same, together with the bark, in washing a sort of garments which they call sarassas; and make of the flowers the confection caryl.

ERYTHRONIUM, dog's-tooth violet, a genus of the monogynia order, and hexandria class of plants; natural order eleventh, sarmentaceæ. COR. hexapetalous and campanulated; with a nectarium of two tubercles adhering to the inner base of every other petal. There is only one species, which, however, admits of several varieties in its flowers, as white, purple, pale red, dark red, crimson, and yellow. The plants are low and herbaceous, with a purple stalk and hexapetalous flowers. All the varieties are hardy and durable; and may be planted in small patches in borders, where they will make a good appearance. They rarely perfect their seeds in this country, but may be propagated by offsets. In Siberia, according to Gmelin, they dry and mix the root of this plant with their soups.

ERYTHROXYLON, in botany, a genus of the trigynia order, and decandria class of plants; CAL. turbinated; petals of the corolla have each a nectariferous emarginated scale at the base; the stamina are connected at the base; the fruit a bilocular plum. Species twelve, African and South American shrubs.

ERYX, in fabulous history, a son of Butes and

Venus, who, relying on his strength, challenged all strangers to fight with him in the combat of the cestus. Hercules accepted his challenge after many had yielded to his superior dexterity; Eryx was killed in the combat, and buried on the mountain, so named from him, where he built a temple to Venus.

Eryx, in ancient geography, a mountain of Sicily near Drepanum, so steep, that the houses built upon it seemed every moment ready to fall. Dædalus enlarged the top, and enclosed it with a strong wall. He also consecrated there to Venus Erycina a golden heifer, which resembled life so much, that it seemed to exceed the power of art.

ERZERUM, the capital of Armenia, and of a pachalic of the same name, is situated on a rising ground at the base of a chain of high mountains, generally covered with snow. The streets are paved, and the houses, which are built of stone, have terraces, on which grass grows which affords herbage for sheep; so that the town, when seen from an eminence, can scarcely be distinguished from a plain. Erzerum is protected on the south by a citadel, which is surrounded by a double wall of stone, and has four gates covered with iron plates. East of the city is an old brick tower, with a clock on its lofty summit. It is the most conspicuous building of the place. The mosques are numerous, amounting, according to some writers, to forty and upwards: besides which there are two Greek churches and one Armenian. Several of the former have domes covered with lead, and are ornamented with gilt balls. There are sixteen baths. The markets are spacious and well supplied with provisions and fruit. Manufactures of considerable extent are also established here, and an extensive trade is carried on in copper, and in articles from Persia, and from north-west Hindostan and its vicinity. The population, amounting to 100,000 or 130,000, are Turks, Greeks, Persians, and Armenians. The inhabitants are in general stout and healthy; but the cold during winter, which commences in August, is intense, and snow remains on the ground from October until March. This town, however, was visited by the plague in 1807, which carried off twenty-five of the inhabitants daily. It is governed by a pacha of three tails, who has a large but mean palace. 250 miles N. N. E. of Aleppo.

ERZGEBIRG (i. e. the Metalliferous Mountains), a chain of mountains in the heart of Germany, between Saxony and Bohemia, and joining the Riesengebirg on the frontiers of Silesia. The highest summits are on the side of Saxony, where they sometimes rise to 3800 or 3900 feet above the level of the sea: the south front of them, on the Bohemian side, exhibits a number of peaks of basalt of a most romantic appearance. The country around the Schneeberg, one of the highest of them, is very barren and denominated the Siberia of Saxony.

Erzgebirg, a circle of the kingdom of Saxony, separated from Bohemia by the foregoing chain, and containing 460,000 inhabitants, on a surface of 2300 square miles. Its principal towns are Freyberg (the capital), Altenburg, Chemnitz, and Zwickau; and its chief branch of industry the working of the mines; which yield iron, copper, tin, lead, cobalt, bismuth, and arsenic. The yearly produce is averaged at from £300,000 to £400,000 sterling: the number of miners at 12,000. This circle is divided into seventeen bailiwics.

ESARHADDON, or Assar-Addon, the son of Sennacherib, and his successor in the kingdom of Assyria, about A.A.C. 712. He united the kingdoms of Nineveh and Babylon; conquered Ethiopia and Syria; sent a colony to Samaria; and his generals took king Manasseh, and carried him in chains to Babylon. He reigned twenty-ine years at Nineveh, from A. M. 3294 to 3322, and thirteen at Babylon; in all forty-two years. He died A. M. 3336, and was succeeded by Saosduchinus. Esarhaddon, in the opinion of Sir Isaac Newton, is the Sardanapalus who died, as Clectarchus says, of old age, after the revolt of Syria; the name Sardanapalus being derived from Asserhadon Pul.

ESCALADE, *n. s.* Fr. *escalade;* Ital. *scalata;* from Lat. *scala*, a ladder. The act of scaling walls.

In Geneva one meets with the ladders, petard, and other utensils, which were made use of in their famous *escalade*. *Addison.*

Escalade, or Scalade, in the military art, is a furious attack of a wall or rampart; carried on with ladders, to pass the ditch or mount the rampart; without proceeding in form, breaking ground, or carrying on regular works for the security of the men. When every thing is ready for the troops to pass the ditch, either by means of boards, hurdles, and fascines, if it is muddy; or by small boats of tin, or baskets covered with skins or oil cloth, if it is deep or filled with water; a party should be placed on the counterscarp, opposite to the landing place, ready to fire at the garrison, if they are alarmed, and oppose the mounting on the rampart. When the ditch is dry, the ladders are fixed in some place farthest distant from the sentinel; and, when the troops have got upon the rampart, they put themselves in order for receiving the enemy: should the sentinel be surprised, and silently overcome, the detachment endeavours to break open the gate and admit the rest of the party. When the ditch is wet, the rampart high, and provided with a revetment, it is very difficult to surprise a town in this way; but where there is no revetment, the troops may hide themselves along the outside of the rampart till all are over.

ESCALLONIA, in botany, a genus of the monogynia order, and pentandria class of plants. The fruit is bilocular and polyspermous; the petals distant and tongue-shaped; the stigma headed. Species two, natives of South America.

ESCAL'OP. See Scallop. A particular kind of shell-fish; indenture of margin (from the figure of the scallop's shell).

The shells of those cockles, *escalops*, and periwinkles, which have greater gravity, were inclosed in stone. *Woodward.*

An inequality of margin; indenture.

The figure of the leaves is divided into jags and *escalops*, curiously indented round the edges. *Ray.*

ESCAMBIA, one of the largest rivers which fall into the bay of Pensacola, in West Florida.

It flows through several channels, which have a number of low islands between them; and is navigable for upwards of 100 miles. On its banks are forests of valuable timber.

ESCAPA'DE, *n. s.* Fr. Irregular motion of a horse.

> He with a graceful pride,
> While his rider every hand surveyed,
> Sprung loose, and flew into an *escapade*;
> Not moving forward, yet with every bound
> Pressing and seeming still to quit his ground.
> *Dryden.*

ESCAPE', *v. a.*, *v. n.*, & *n. s.* } Fr. *echapper*;
ESCAP'ING, *n. s.* } Span. and Port. *escapar*; Ital. *scappare*, from Lat. *ex* from, and *capio* to take. To take (one's self) away from; to fly; avoid; obtain exemption from; pass away unobserved: as a neuter verb to withdraw; avoid punishment or injury: as a substantive, flight; excursion: hence evasion or excuse, and mistake.

*Escape* for thy life; look not behind thee, neither stay thou in all the plain: *escape* to the mountain, lest thou be consumed. *Genesis.*

Benhadad, the king of Syria, *escaped* on horse. *Chronicles.*

Should we again break thy commandments, wouldst thou not be angry with us till thou hast consumed us, so that there should be no remnant nor *escaping*? *Ezra* ix. 14.

Men are blinded with ignorance and errour: many things may *escape* them, in many they may be deceived. *Hooker.*

He might put on a hat, a muffler, and a kerchief, and so *escape*. *Shakspeare. Merry Wives of Windsor.*

> Thousand '*scapes* of wit,
> Make thee the father of their idle dreams,
> And rack thee in their fancies. *Id.*

He enjoyed neither his *escape* nor his honour long; for he was hewn in pieces. *Hayward.*

St. Paul himself did not despise to remember whatsoever he found agreeable to the word of God among the heathen, that he might take from them all *escape* by way of ignorance. *Raleigh.*

Pride and malice did not care so much for safety, as for conquest; it would not content them to *escape* Israel, if Israel may *escape* them. *Bp. Hall's Contemplations.*

> Loose '*scapes* of love. *Milton.*
> 'Tis still the same, although their airy shape
> All but a quick poetic sight *escape*. *Denham.*

We made an *escape* not so much to seek our own, as to be instruments of your safety. *Id.*

Since we cannot *escape* the pursuit of passions; and perplexity of thoughts, there is no way left but to endeavour all we can either to subdue or divert them. *Temple.*

The reader finds out those beauties of propriety in thought and writing, which *escaped* him in the tumult and hurry of representing. *Dryden.*

Had David died sooner, how much trouble had he *escaped*, which by living he endured in the rebellion of his son! *Wake.*

Men of virtue have had an extraordinary *escape* out of such dangers as have enclosed them, and which have seemed inevitable. *Addison.*

In transcribing there would be less care taken, as the language was less understood, and so the *escapes* less subject to observation. *Brerewood on Languages.*

To convince us that there was no way to *escape* by climbing up to the mountains, he assures us that the highest were all covered. *Woodward.*

Laws are not executed, men of virtue are disgraced, and murderers *escape*. *Watts's Logick.*

Fear loses its purpose when we are sure it cannot preserve us, and we should draw resolution to meet it, from the impossibility to *escape* it. *Steele.*

As boiling water does not grow hotter by longer boiling, if the particles that receive greater heat can *escape*. *Franklin.*

> There dwell the most forlorn of humankind,
> Immured though unaccused, condemned untried,
> Cruelly spared, and hopeless of *escape*.
> There, like the visionary emblem seen
> By him of Babylon, life stands a stump,
> And, filleted about with hoops of brass,
> Still lives, though all his pleasant boughs are gone.
> *Cowper.*

> Sweet are our *escapes*
> From civic revelry to rural mirth;
> Sweet to the miser are his glittering heaps;
> Sweet to the father is his first-born's birth.
> *Byron.*

ESCAPE, in law, is of two sorts:

ESCAPE, NEGLIGENT, is where one is arrested, and afterwards escapes against the will of the person that arrested him, and is not pursued with fresh suit, and retaken before the person pursuing has lost sight of him. By stat. 8 and 9 Will. III. c. 26, the keepers of prisons conniving at escapes shall forfeit £500, and in civil cases the sheriff is answerable for the debt.

ESCAPE, VOLUNTARY, when a man arrests another for felony, or other crime, and afterwards lets him go freely by consent; in which case, the party that permits such escape is held guilty, committed, and must answer for it.

ESCAPE, ASSISTING IN. By stat. 16 Geo. II. c. 31, it is enacted, That persons who any ways assist a prisoner, committed for treason or felony, to attempt his escape from any gaol, shall be adjudged guilty of felony and be transported; and if the prisoner be committed for petit larceny, or other inferior offence, or upon process for £100 debt, &c., the offenders are liable to fine and imprisonment. And where any person conveys any arms, instrument, or disguise, to a prisoner in gaol for felony, &c., or for his use, without the privity of the gaoler, in order to an escape, though no escape be actually made, it is likewise felony and transportation. Also if one assist any prisoner to escape from any constable, or other officer or person in whose custody he is, by virtue of a warrant of commitment for felony, it is declared to be the like offence. See also stat. 6 Geo. I. c. 23, § 5. 24 Geo. III. c. 56.

The indictment on the stat. 16 Geo. II. c. 31, must state that the instruments were conveyed to the prisoner with a design to effectuate his escape. But no indictment can be maintained on this statute for contributing to the escape of a prisoner committed on suspicion only.

By stats. 13 Geo. III. c. 31; 44 Geo. III. c. 92; and 45 Geo. III. c. 92, to render more easy the apprehending and bringing to trial offenders escaping from one part of the United Kingdom to the other, and also from one county to the other, it is enacted, That offenders escaping from England to Scotland, or from Great Britain to

Ireland, or vice versâ, may be apprehended and conveyed back to the place from whence they escaped. By the said act 44 Geo. III. c. 92, offenders escaping with stolen goods from one part to another of the United Kingdom, may be tried in the place where the goods shall be found in their custody, and receivers in the place where they receive. By 54 Geo. III. c. 186, all warrants issued in England, Scotland, or Ireland, may be executed in any part of the United Kingdom. By the said acts 13 Geo. III. c. 31; 44 Geo. III. c. 92; and 45 Geo. III. c. 92, persons committing offences in one county may be pursued and apprehended in any other county. Stat. 52 Geo. III. c. 156, is for the more effectual punishment of persons aiding prisoners of war to escape from his majesty's dominions, which is a transportable offence. See Rescue.

Escape-Warrant. If any person committed or charged in custody in the King's Bench or Fleet prison, in execution, or on mesne process, &c., go at large; on oath thereof before a judge of the court where the action was brought, an escape-warrant shall be granted, directed to all sheriffs, &c., throughout England, to retake the prisoner, and commit him to gaol where taken, there to remain till the debt is satisfied: and a person may be taken on a Sunday upon an escape-warrant. And the judges of the respective courts may grant warrants, upon oath to be made before persons commissioned by them to take affidavits in the country (such oath being first filed), as they might do upon oath made before themselves. 5 Ann. c. 9. A sheriff ought not to receive a person taken on escape-warrant, &c., from any but an officer; not from the rabble, &c., which is illegal. 3 Salk. 149. A person being arrested and carried to Newgate by virtue of an escape-warrant, moved to be discharged, because he said he was abroad by a day-rule when taken; but, it appearing by affidavit that he was taken upon the escape-warrant before the court of B. R. sat that morning, they refused to set him at liberty.

Escape Point, a cape on the west coast of the island of Revilla Gigedo, in the North Pacific, so called by Vancouver, from landing here after being attacked by the savages in Traitor's Cove. It is in long. 228° 30′ E., lat. 55° 37′ N.

Escape River, a river of North America, which runs into the Mississippi, in lat. 43° 35′ N.

ESCA'RGATOIRE, *n. s.* Fr. A nursery of snails.

At the Capuchins I saw *escargatoires*, which I took the more notice of, because I do not remember to have met with any thing of the same kind in other countries. It is a square place boarded in, and filled with a vast quantity of large snails that are esteemed excellent food, when they are well dressed.
*Addison.*

ESCHAL'OT, *n. s.* Fr. *eschalot*; Ital. *cepaletto*, perhaps from Lat. *cepula*, an onion.

*Eschalots* are now from France become an English plant, managed after the same manner as garlick; only they are to be set earlier, and taken up as soon as the leaves begin to wither, lest the winter kill them. *Mortimer's Husbandry.*

Eschalot. See Allium.

ESCHAR', *n. s.* } Gr. ἐσχάρα; Old
Escharot'ic, *adj.* & *n. s.* } Fr. *escar*, a scab. A crust or scar made by hot applications: escharotic is caustic: a caustic application

An *eschar* was made by the cathæretick, which we thrust off, and continued the use of *escharoticks*.
*Wiseman's Surgery.*

*Escharoticks* applied of ash-ashes, or blistering plaster. *Floyer.*

When issues are made, or bones exposed, the *eschar* should be cut out immediately.
*Sharp's Surgery.*

ESCHARA, in natural history, a species of coralline, or coralloid, the characters of which are these: they are of a stony or coral-like hardness, and resemble a woven cloth in their texture; and the microscope shows, that they consist of arrangements of very small cells, whose surfaces appear much in that form. Linnæus makes it a species of millepora, in the class of lithophytes. The narrow-leaved hornwrack divides as it rises into narrow leaves made up of regular rows of oblong square-shaped cells placed alternately by each other, and opposite to an equal number on the other side of the leaf; like a honeycomb: from these leaves proceed other still smaller foliaceous ramifications, many of which seem to be connected at the lower part by tubuli, as in the corallines; by which means they can ply to and fro more freely in the water. The broad-leaved hornwrack, when fresh taken out of the sea, is of a spongy soft texture, and smells very fishy; but, when it has lain for some time on the shore, it becomes stiff and horny, like some sort of withered leaves. Both surfaces, when examined by glasses, appear to be covered with cells; and, when a piece of it is cut across, one may discover the thin membrane that serves as a base to the cells of each surface. The form of the cells is very remarkable, each one being arched at the top, and contracted a little at the lower part of the sides to make way for the arches of the two next adjoining cells; so that by this particular construction no room is lost. The entrance of the cells is immediately under the arch of each cell, and the walls of the cells seem to be fortified with spines. Jussieu discovered small polypes extending themselves out of these cells, which he has described in the Memoires of the Academy of Sciences, 1742.

ESCHEAT', *n. s.*, *v. n.*, & *v. a.* French *echet*, from *echoir* to lapse; Lat *excado* to fall from. Land forfeited to the lord or to the king; see below: the verb being derived from the noun, signifies to fall to a lord or the king; to forfeit.

In the last general wars there, I knew many good freeholders executed by martial law, whose lands were thereby saved to their heirs, which should have otherwise *escheated* to her majesty.
*Spenser on Ireland.*

If the king's ordinary courts of justice do not protect the people, if he have no certain revenue or *escheats*, I cannot say that such a country is conquered.
*Davies on Ireland.*

At a Bartholemew fair at London, an *escheator* of the city arrested a clothier, and seized his goods.
*Camden's Remains.*

He would forbear to alienate any of the forfeited *escheated* lands in Ireland, which should accrue to the crown by reason of this rebellion. *Clarendon.*

**Escheat** (from old Fr. *eschoir*, to fall or happen), in English law, a casual descent, in the nature of forfeiture, of lands and tenements within his manor to a lord, on account of the felony of such tenant. Blackstone defines it 'an obstruction of the course of descent, and a consequent determination of the tenure, by some unforeseen contingency, in which case the land naturally results back, by a kind of reversion, to the original grantor, or lord of the fee.' Escheats are also divided into those propter defectum sanguinis, and those propter delictum tenentis; but both species may be included under the first denomination; since he that is attainted suffers an extinction of his blood, as well as he that dies without relations.

Inheritable blood is wanting, 1. When the tenant dies without any relations on the part of any of his ancestors. 2. When he dies without any relations on the part of those ancestors from whom his estate descended. 3. When he dies without any relations of the whole blood. 4. When he is attainted for treason or felony.—In all these cases the lands escheat to the lord.

Care must be taken to distinguish between forfeiture of lands to the king, and this species of escheat to the lord: a general rule is that such escheat operates in subordination to the more ancient and superior law of forfeiture or escheat to the crown.

The doctrine of escheat upon attainder, taken singly, is that the blood of the tenant, by the commission of any felony (under which denomination all treasons were formerly comprised), is corrupted and stained, and the original donation of the feud is thereby determined. Upon the thorough demonstration of which guilt, by legal attainder, the feudal covenant and mutual bond of fealty are held to be broken, the estate instantly falls back from the offender to the lord of the fee, and the inheritable quality of his blood is extinguished and blotted out for ever. In consequence of which corruption and extinction of hereditary blood, the land of all felons would immediately revest in the lord, but that the superior law of forfeiture intervenes, and intercepts it in its passage: in case of treason, for ever; in case of other felony, for only a year and a day. 2 Inst. 36.

In cases of escheat, the blood of the tenant being utterly corrupted and extinguished, it follows, not only that all that he has at the time of his offence committed shall escheat from him, but also that he shall be incapable of inheriting any thing for the future. This farther illustrates the distinction between forfeiture and escheat. If therefore a father be seised in fee, and the son commits treason and is attainted, and then the father dies: the land shall escheat to the lord, because the son, by the corruption of his blood, is incapable to be heir, and there can be no other heir during his life, but nothing shall be forfeited to the king, for the son never had any interest in the lands to forfeit. Co. Lit. 13. In this case the escheat operates, and not the forfeiture; but in the following instance the forfeiture works, and not the escheat. As where a new felony is created by act of parliament, and it is provided (as is frequently the case) that it shall not extend to corruption of blood; here the lands of the felon shall not escheat to the lord, but yet the profits of them shall be forfeited to the king for a year and a day, and so long after as the offender lives. 3 Inst. 47.

**Escheat**, in Scots law, is that forfeiture which is incurred upon a person's being denounced a rebel.

ESCHEW', *v. a* Fr. *esquiver;* Span. and Port. *esquivar;* Belg. *schouwen;* Teut. *scheuhen*, probably from Teut. *scheu*, fear. To shrink from; avoid; shun.

Job was perfect and upright, and one that feared God and *eschewed* evil. *Job* i. 1.

*Eschew* evil and do good. *Heb.* iii. 11.

Correct a wise man that would *eschew* ill name,
And fayne woulde learne, and his lewde life amende,
And to thy wordes he gladly shall intende.
*Barclay.* 1550.

So let us, which this change of weather view,
Change eke our minds, and former lives amend;
The old year's sins forepast let us *eschew*,
And fly the faults with which we did offend.
*Spenser.*

He who obeys, destruction shall *eschew;*
A wise man knows both when and what to do.
*Sandys.*

She was like a young fawn, who, coming in the wind of the hunters, doth not know whether it be a thing or no to be *eschewed*. *Sidney.*

Of virtue and vice, men are universally to practise the one, and *eschew* the other. *Atterbury.*

ESCHRAKITES, or Esrakites, a sect of philosophers among the Mahommedans, who adhere to the doctrines of Plato. The word is derived from the Arabic שרק schraca, which in the fourth conjugation אשרק aschracha, signifies to shine, or glitter like the sun; so that eschrakite seems to import illumined. These Mahommedan Platonists place their highest good in the contemplation of the Divine Majesty; despising the gross descriptions in the Alcoran of Paradise. They carefully avoid vice, preserve an equal temper, love music, and divert themselves with composing poems or spiritual songs. The sheicks or priests, and the chief among the preachers of the imperial mosques, are eschrakites.

ES'CORT, *n. s.* & *v. a.* French *escorte*; Ital. *scorta* or *cohorta*, from Lat. *cohors*, a cohort or division of soldiers. Convoy, military guard: to guard or convoy: and hence to protect in any way from place to place.

*Escort* of deserters consists in general of a corporal and three rank and file, unless the number exceed four or five. *James.*

ESCOT, *n. s.* & *v. a.* Fr. A tax paid in boroughs and corporations towards the support of the community, which is called scot and lot. See Scot. To pay a man's reckoning; to support.

What, are they children? Who maintains them? How are they *escoted*? *Shakspeare. Hamlet.*

ESCOUADE, or Squad, is usually the third or fourth part of a company of foot; so divided for mounting guards, and for the more convenient relieving of one another. It is equivalent to a brigade of a troop of horse. See Brigade.

ESCO'UT, *n. s.* Fr. *escouter*. Listeners or spies; persons sent for intelligence. Now Scout, which see.

'They were well entrenched, having good *escout* abroad, and sure watch within. *Hayward.*

ESCU'AGE, *n. s.* From Fr. *escu.* a shield.

*Escuage*, that is, service of the shield, is either uncertain or certain. *Escuage* uncertain is likewise twofold: first, where the tenant by his tenure is bound to follow his lord, going in person to the king's wars so many days. The days of such service seem to have been rated by the quantity of the land so holden: as, if it extend to a whole knight's fee, then the tenant was bound thus to follow his lord forty days. A knight's fee was so much land as, in those days, was accounted sufficient living for a knight; and that was six hundred and eighty acres as some think, or eight hundred as others, or £15 per annum. Sir Thomas Smith saith, that census equestris is £40 revenue in free lands. If the land extend but to half a knight's fee, then the tenant is bound to follow his lord but twenty days. The other kind of this *escuage* uncertain is called Castleward, where the tenant is bound to defend a castle. *Escuage* certain is where the tenant is set at a certain sum of money to be paid in lieu of such uncertain services. *Cowel.*

ESCUAGE, or SCUTAGE, an ancient knight's service, called also 'service of the shield;' the tenant holding by which was obliged to follow his lord at his own expense to the Scottish or Welsh wars. Tenants sometimes compounded for it by a pecuniary satisfaction, which was levied by assessments at a certain rate; and thus it became a pecuniary in lieu of a military service. The first instance of this occurs in 5 Hen. II. on account of his expedition to Toulouse; it afterwards became more general and oppressive; so that king John was obliged to consent, by his magna charta, that no scutage should be imposed without consent of parliament; but the clause was omitted in the charter of Hen. III. which directs, that it should be taken as it used to be in the time of Henry II. or in a reasonable and moderate manner. However, it was afterwards enacted by stat. 25 Edw. I cap. 5 and 6, and many subsequent statutes, that the king should take no aids or tasks but by the common assent of the realm; and it appears that scutages were the ground-work of all succeeding subsidies, and of the land-tax of later times. Blackst. Com. vol. ii. p. 74. Escuage was also a reasonable aid, demanded by the lord of his tenants, who held of him by knight's service. See AID. 'Concesserunt domino regi ad maritandum filiam suam de omnibus qui tenent de domino rege in capite de singulis scutis 20 solidos solvendos.' *Matt. Paris, anno* 1242.

ESCULENT, *adj.* & *n. s.* Lat. *esculentus*, from *esca* food. Edible: any thing fit for food.

This cutting off the leaves in plants, where the root is the *esculent*, as radish and parsnips, it will make the root the greater, and so it will do to the heads of onions; and where the fruit is the *esculent*, by strengthening the root, it will make the fruit also the greater. *Bacon's Natural History.*

I knew a man that would fast five days; but the same man used to have continually a great wisp of herbs that he smelled on, and some *esculent* herbs of strong scent, as garlick. *Id.*

In Siberia the roots of the butomus, or flowering rush, are eaten, which is well worth further inquiry, as they grow spontaneously in our ditches and rivers, which at present produce no *esculent* vegetables; and might thence become an article of useful cultivation. *Darwin.*

ESCURIAL, a village and royal residence, fifteen miles north-west of Madrid, Spain. It is the largest and most superb structure in the kingdom, and one of the finest in Europe. The word is Arabic, meaning 'a place of rocks,' and the site is sufficiently dry and barren, surrounded with rugged mountains; so that every thing which grows has been the offspring of art and culture. The place was chosen, it is said, for the sake of the stone so readily yielded here, and which is an excellent pale granite; and the design of erecting the palace was to commemorate a victory which Philip II. obtained over the French, by the assistance of the English forces, at St. Quintin, on St. Laurence's day, in the year 1557. The Spanish description of the structure forms a considerable 4to. volume. Its founder expended upon it six millions of ducats. The apartments are decorated with an astonishing variety of paintings, sculpture, tapestry, ornaments of gold and silver, marble, jasper, and other curious stones. Here is also a noble and richly ornamented church; a mausoleum; cloisters; convent; a college, and a library, containing about 30,000 volumes; besides large apartments for all kinds of artists and mechanics; and noble walks, with extensive parks, gardens, and fountains. The fathers that live in the convent are 200, and they have an annual revenue of £12,000. The whole, begun by Philip in 1562, completed in twenty-two years. The total expense was estimated at nearly £3,000,000 sterling. The place is a monument of Spanish magnificence and superstition united. Its several courts and quadrangles are disposed in the shape of a gridiron, the instrument of the martyrdom of St. Laurence; the apartment where the king resides forming the handle. The principal building is a long square of 640 by 580, and the height to the roof sixty feet. At each angle is a square tower of 200 feet high. The number of windows in the west front is 200; in the east front 366. The orders are Doric and Ionic. In the principal front are three doors. Over the grand entrance are the arms of Spain, carved in stone; and a little higher, in a niche, a statue of St. Laurence, in a deacon's habit, with a gilt gridiron in his right hand, and a book in his left. Directly over the door is a basso relievo of two enormous gridirons. This vast structure, however, with its narrow high towers, small windows, and steep sloping roof, exhibits altogether a very uncouth appearance; at the same time that the domes, and the immense extent of its fronts, give it, on the whole, considerable pretensions to grandeur. The church is in the centre; the cupola is bold and light. The high altar is composed of rich marbles, agates, and jaspers of great rarity, the produce of Spain. Two magnificent catafalquas fill up the side arcades of this sanctuary: on one the emperor Charles V., his wife, daughter, and two sisters, are represented in bronze, larger than life, kneeling; opposite are the effigies of Philip II. and of his three wives, of the same materials, and in the same devout attitude. Underneath is the burial-place of the royal family, called the

pantheon: twenty-five steps lead down to this vault, over the door of which is a Latin inscription, denoting, that 'this place, sacred to the remains of the Catholic kings,' was intended by Charles the emperor, resolved upon by Philip II., begun by Philip III., and completed by Philip IV. The mausoleum is circular, thirty-six feet diameter, incrusted with fine marble in an elegant taste. The bodies of the kings and queens lie in tombs of marble, in niches, one above the other. The collection of pictures dispersed about various parts of the church, sacristy, and convent, was thought at one time to equal that of any gallery in Europe. Some of them were carried off by the French during the late war, but they have been subsequently restored. The library of the monastery contains a valuable collection of manuscripts and old books, although part of the latter were destroyed by a fire in 1671.

A beautiful road, about a quarter of a league in length, and planted on both sides with lofty elms and linden trees, leads to the village, as also does a subterraneous corridor, arched with free-stone, and called the Mina. Another road leads to Fresneria, a country-house situated a quarter of a league to the east of the palace, and in the centre of it is a piazza, supported by Doric columns. The road to Madrid is excellent, but is through a naked country. In going from Madrid it first winds along the Manzanarez, and, leaving the Casa del Campo, it passes Pardo, and then three houses in succession, where relays of horses are provided. It then conducts to Valde Morillo, from whence the Escurial is first seen.

Spacious reservoirs have been constructed in the neighbouring mountains for collecting the water, which is conveyed by an aqueduct to supply ninety-two fountains. The royal family, before the Spanish revolution, inhabited the Escurial from September to December, a season almost wholly employed in devotion. The position of the Escurial, according to trigonometrical observations, is W. long. 4° 7′ 50″, and N. lat. 40° 35′ 50″.

ESCUTCHEON. Fr. *ecusson*, from Latin *scutum*, a leather shield. The shield of a family, on which originally the family arms were depicted: hence any emblazonment of arms.

There be now, for martial encouragement, some degrees and orders of chivalry, and some remembrance perhaps upon the *escutcheon*. *Bacon.*

We will pass over the *escutcheons* of the tribes of Israel, as they are usually described in the maps of Canaan. *Browne.*

Titles and mottoes to books are like *escutcheons* and dignities in the hands of a king. The wise sometimes condescend to accept of them; but none but a fool would imagine them of any real importance. *Goldsmith.*

I have not the most distant pretensions to assume that character which the pye-coated guardians of *escutcheons* call a gentleman. *Burns.*

Escutcheon, or Scutcheon. See Heraldry.

ESK, North, a considerable river of Angusshire, formed by the junction of two small rivers called the East and West Waters. It separates the counties of Angus and Mearns, and falls into the German Ocean, two miles north-east of Montrose. It has three remarkable bridges over it: the first consisting of one arch, called the Gannachie Bridge, about ten miles north-west of Montrose; the second of three arches, about four miles north of Montrose, called the Old North Water Bridge, built above 200 years ago; and the third of seven arches, near the mouth of the river, called the New North Water Bridge. Vast quantities of salmon are taken in this river and sent to London.

Esk, South, a considerable river of Angusshire, which, after traversing the whole breadth of the county in many beautiful meanders, passes by Brechin, glides through the capacious basin and harbour of Montrose, and falls into the German Ocean, a mile west of that town. An elegant new bridge, or rather two bridges, were erected over the mouth of this river in 1792-3, from Forthill to the isle of Inch-Broyock, and from that to Craig. See Montrose.

ESKDALE, the most eastern division of Dumfriesshire, so named from the river Esk running through it. It was formerly a lordship or barony in the family of Maxwell; but attainted on account of the attachment of that family to the house of Stuart.

ESKI-ZAGRA, a large town of European Turkey, in Romania, seldom visited by Europeans. The population, said to amount to 20,000, are employed in hardware, carpet, and leather manufactures.

ESMERALDAS, a province of Quito, South America, situated between the jurisdictions of Guayaquil and Barbacoas, on the coast of the South Sea. It is estimated at fifty-six leagues in length, and abounds in wax, copal, balsams, manilla, indigo, tobacco, and excellent cocoa. Its mountains are clothed with rare and valuable woods.

Esmeraldas, a port of the foregoing province, situate on the coast of the South Sea, on a strip of land which forms the mouth of the river Esmeraldas.

Esmeraldas, a considerable river of the same province, which has its rise in the mountains of Pasto, and falls into the Pacific Ocean in lat. 0° 53′ N. 2. A river of Brasil, in the province of Porto Seguro, which enters the Rio Dolce.

ESNE, or Asna, a considerable sea-port town of Upper Egypt. To the description of this place, which will be found under Asna, we may add the following, from the Travels of Denon. 'Esne is the ancient Latopolis. Some remains are still visible of its port or quay on the bank of the Nile, which has been often repaired; but, notwithstanding all that has been done for it, still remains in a very miserable situation. This town also contains the portico of a temple, which appears to me to be the most perfect monument of ancient architecture. It is situated near the bazaar in the great square, and would make an incomparable ornament to this spot, if the inhabitants had any idea of its merit; but instead of this they have deformed it by the most miserable ruined hovels, and have devoted it to the vilest purposes. The portico is very well preserved, and possesses a great richness of sculpture: it is composed of eighteen columns with

broad capitals; these columns are noble and elegant, though they now appear in the most disadvantageous light; the rubbish should be cleared to find if any part of the cellar remains. The hieroglyphics with which it is covered, within and without, are executed with great care; they contain, among other subjects, a Zodiac, and large figures of men with crocodiles' heads: the capitals, though all different, have a very fine effect; and, as an additional proof that the Egyptians borrowed nothing from other people, we may remark, that they have taken all the ornaments, of which these capitals are composed, from the productions of their own country, such as the lotus, the palm-tree, the vine, the rush, &c.' The inhabitants of Esne having revolted against the persecution of Dioclesian, that emperor destroyed this town and put them to the sword. Thus consecrated by religion, it has long been a celebrated place of pilgrimage among the Copts, who repair to it from the most distant provinces. Mr. Hamilton says, that there is a great variety in the sculptures upon the above-mentioned portico, and he was inclined, from the rude manner in which they are executed, to ascribe to them a very remote antiquity. Although equally mysterious and unintelligible with those on similar buildings throughout Egypt, they are so numerous as to afford the amplest field for studying the whole range of the learning, mythology, and superstitions of the ancient inhabitants of this country. The ceiling is replete with mysterious representations; among which are figures surrounded with stars, and boats conveying the most mystical of their sacred animals.

ESOX, in ichthyology, a genus of fishes belonging to the order of abdominales. The body is elongated; the head is plainish above; the upper jaw is plain, and shorter than the under one, which is dotted; and the branchiostege membrane has from seven to twelve rays. Species fifteen in number. 1. E. barracuda of Catesby is found in great numbers about the seas of the Bahamas and as far as Jamaica. Its body and head very much resemble the European pikes: the eyes are large; the mouth is very wide; the under jaw longer than the upper: there are four very large and sharp teeth in the front of the upper jaw; in that of the lower, a single great and sharp tooth: there are two dorsal fins: the tail is large and forked: color a deep brown, whitish on the belly. It grows to the length of ten feet. It swims exceeding swiftly; is of dreadful voracity; and will attack men when they are bathing. The flesh has a disagreeable smell and taste, and is even poisonous; causing great sickness, vomiting, intolerable pains in the head, and loss of hair and nails; yet the hungry Bahamans formerly were under the necessity, at times, of feeding on it. 2. E. belone, the gar, or sea needle, sometimes grows to three feet or more. The jaws are very long, slender, and sharp-pointed; the under jaw extends much farther than the upper; and the edges of both are armed with numbers of short and slender teeth; the tongue is small: the eyes are large; the irides silvery; and the nostrils wide and round. The body is slender, the belly quite flat, bounded on both sides by a rough line. The tail is much forked. The colors are extremely beautiful when the fish is in the water: the back is a fine green, beneath which appears a rich changeable blue and purple: the sides and belly are of a fine silvery hue. This fish is found in many places, and comes in shoals on our coasts in the beginning of summer. It precedes the mackerel, and resembles it in taste; but the light green which stains the back-bone gives many people a disgust to it. 3. E. lucius, the pike, has a flat head: the upper jaw is broad, and shorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures. The teeth are very sharp, disposed not only in the front of the upper jaw, but in both sides of the lower; in the roof of the mouth, and often in the tongue. The slit of the mouth is very wide; the eyes small. The pike is common in most lakes of Europe; but the largest are those taken in Lapland, which, according to Scheffer, are sometimes eight feet long. They are taken there in great abundance, dried, and exported for sale. The largest fish of this kind caught in England, weighed thirty-five pounds. All writers who treat of this species bring instances of its voraciousness. It has been known to choke itself by attempting to swallow one of its own species which proved too large a morsel. Yet its jaws are very loosely connected, and have on each side an additional bone like tl jaw of a viper, which renders them capable greater distension when it swallows its prey. will devour the water rat, and draw down tl young ducks as they are swimming about. Ge ner relates, that a famished pike in the Rhon seized on the lips of a mule that was brought water, and that the beast drew the fish out befo it could disengage itself; that people have bee bit by these voracious creatures while they we washing their legs; and that the pike will eve contend with the otter for its prey, and endeavo to force it out of its mouth. Small fishes sho the same uneasiness at the presence of this tyran that little birds do at the sight of the hawk owl. When the pike lies dormant near the su face, as is often the case, the smaller fishes a observed to swim round it in vast numbers a in great anxiety. Pikes are often haltered in noose, and taken while they thus lie asleep, they are often found in May, in the ditches ne the Thames. In the shallow water of the Li colnshire fens they are often taken in a manne we believe, peculiar to that county and to tl island of Ceylon. The fisherman uses a hemi pherical basket, open at top and bottom, call a crown net. He stands at the end of one of t little fen boats, and frequently puts his bask down to the bottom of the water; then poking stick into it, discovers whether he has any boo by the striking of the fish; and vast numbers pike are taken in this manner. The longevity this fish is very remarkable, if we may credit tl accounts given of it. Rzaczynski tells us of o that was ninety years old; but Gesner relat that, in 1497, a pike was taken near Ha lbrun Suabia, with a brazen ring affixed to it, on whi were these words in Greek characters: 'I am tl fish which was first put into this lake by the g vernor of the universe, Frederick II. the 5th

October, 1230.'!! Pikes spawn in March or April, according to the coldness or warmness of the weather. When they are in high season, their colors are very fine, being green, spotted with bright yellow; and the gills are of a most vivid and full red. When out of season, the green changes to a gray, and the yellow spots turn pale. 4. E. saurus, the saury, is eleven inches long; the nose slender; the jaws produced like those of the gar, but equal; the eyes large; the body anguilliform, but towards the tail small and tapering. The tail is forked; the back dusky; the belly silvery. Great numbers of these fish were thrown ashore on the sands of Leith near Edinburgh, after a storm in November 1768. Rondeletius describes this species among the fish of the Mediterranean.

ESPAGNE (John d'), a French protestant divine of some celebrity in the seventeenth century, was born at Dauphinè, and became a minister of the French church in London. He occupied this post during the reigns of James I. and Charles I., and published several tracts, which were afterwards collected and published at Geneva and the Hague, in three and in two volumes 12mo., 1670. He also published a work, which he dedicated to Charles I., entitled Erreurs Populaires en points Generaux qui concernent l'Intelligence de la Religion. Bayle speaks of his pieces in high terms.

ESPAGNE, in geography. See EPAIGNE.

ESPAGNET (John d'), a French philosopher of the seventeenth century, was president of the parliament of Bourdeaux. He published a work entitled Enchiridion Physicæ Restitutæ; and in French La Philosophie des Anciens retablie en sa Pureté. This may be regarded as the first book that appeared in France on an Anti-Aristotelian system of physics. He published also a work concerning the philosopher's stone, entitled Arcanum Hermeticæ Philosophiæ Opus. Also an old MS. entitled Le Rozier des Guerres, found in the king's closet at Nerac, and attributed, though erroneously, to the pen of Louis XI. To this work he added a treatise of his own, on the Education of a Prince.

ESPALIER, *n.s.* Fr. *espalier;* Ital. *spalliera;* Swed. *spalier*; Teut. *spalier*, probably from Goth. *spala;* Swed. *spiale;* Erse. *spale*, a lath; but Mr. Thomson derives it from Ital. *spalla*; Lat. *scapula*, the back between the shoulders: hence *spalliera*, the back of a garden bench. A tree planted and cut so as to join others.

Plant your fairest tulips in places of shelter, and under *espaliers*. *Evelyn's Kalendar.*

Behold Vilario's ten years' toil complete,
His arbours darken, his *espaliers* meet. *Pope.*

ESPALIERS are planted about a garden, or in hedges, so as to enclose quarters or separate parts of a garden; and are trained up regularly to a lattice of wood-work in a close hedge. They are of great use in a kitchen garden, to shelter the tender plants, and to screen them from the sight of persons in the walks. The trees chiefly planted for espaliers, are apple, pear, and plum trees. Some plant apples grafted upon paradise stocks; but it is better to plant those grafted upon crabstocks, or Dutch stocks; which will both cause them to bear sooner, and prevent their growing too luxuriant. The best kind of apples for this purpose are the golden pippin, nonpareil, rennet or nonsuch, &c.; and the best sort of pears, are the jargonelle, blanquette, &c. These last, if designed for a strong moist soil, should be grafted upon quince stocks; but if for a dry soil, upon free stocks. While the trees are young, it is sufficient to drive a few stakes into the ground on each side of them; fastening the branches to these in an horizontal position, as they are produced. This method will do for the first three years; after which an espalier should be made of ash poles, whereof there must be two sorts, larger and smaller; the former to be driven upright into the ground, a foot asunder, and the latter, or slender poles, to be nailed across these, at about nine inches. When the espalier is thus framed, the branches are to be fastened to it with other twigs; horizontally and at equal distances. Fruit trees thus managed are preferable to any others; not only as bearing better tasted fruit, but as taking up very little room.

ESPE'CIAL, *adj.* } ESPE'CIALLY, *adv.* } Fr. *special*; Lat. *specialis à species*, the appearance, from *specto*, Gr. σκεπτω; Heb. שקף, to see. Principal; chief; especially, is particularly; chiefly; in an uncommon degree.

I somewhat marvel that they *especially* should think it absurd to oppose church government, a plain matter of action, unto matter of faith, who know that themselves divide the gospel into doctrine and discipline. *Hooker.*

Would you proceed *especially* against Caius Marcius? *Shakspeare.*

They had the *especial* engines been, to rear
His fortunes up. *Daniel's Civil War.*

This delight children take in doing of mischief, but more *especially* the pleasure they take to put any thing to pain that is capable of it, I cannot persuade myself to be any other than a foreign and introduced disposition *Locke.*

Providence hath planted in all men a natural desire and curiosity of knowing things to come; and such things *especially* as concern our particular happiness, or the general fate of mankind. *Burnet.*

Nothing that is not a real crime makes a man appear so contemptible and little in the eyes of the world as inconstancy, *especially* when it regards religion or party. *Addison.*

But *especially* must you attend to the occasions which most usually betray you into your favorite vices; and consider the spring from whence they arise. *Mason.*

I can't but say it is an awkward sight
To see one's native land receding through
The growing waters; it unmans one quite,
*Especially* when life is rather new. *Byron.*

ESPERA'NCE, *n.s.* Fr. Hope. Not used.

To be worst,
The lowest most dejected things of fortune,
Stands still in *esperance*, lives not in fear. *Shakspeare. King Lear.*

Yet there is a credence in my heart,
An *esperance* so obstinately strong,
That doth invert th' attest of eyes and ears. *Shakspeare.*

ESPIERS, a town of West Flanders, in the department of Jemappe, and kingdom of the Netherlands. A considerable French force at-

tacked the English and Austrians in this city on the 22nd of May, 1794; but were repulsed after an obstinate engagement.

ESPER (John Frederic), a German zoologist and astronomer of the eighteenth century, was born at Drossenfeld, Bayreuth, in 1732. He first studied at Erlangen, where he applied himself chiefly to theological pursuits, but at the same time made himself well acquainted with natural history and botany. He died of a fever in July 1781, leaving behind him a considerable reputation as a naturalist, particularly in that department which relates to the zoolites in the principality of Bayreuth. Here is a number of large subterranean caverns, partly insulated, and partly connected with each other, which contain immense numbers of bones of various animals. The opening into them is highly picturesque, but almost as soon as a person enters he is surrounded by darkness, and the passage becomes still more difficult and narrow, till the eye at last is struck by the immense extent of an awful arch, which on every side presents fissures and clefts, strewed with the fragments of once living bodies. With the aid of an ingenious apothecary of Erlangen, Esper undertook an examination and description of these curiosities, and published the result of his labors under the following title: An Accurate Description of the Zoolites of Unknown Animals, &c. This was published at Nuremberg, in the year 1774, in folio, with fourteen illuminated plates. Esper was also author of some papers in the Transactions of the Friendly Society of the Searchers into Nature; and he wrote an account of A Method of determining the Orbits of Comets, and other Celestial Bodies without Instruments or Mathematical Calculations.

ESPLANA'DE, *n. s.* Fr. In fortification, the same with the glacis of the counterscarp originally; but now it is taken for the empty space between the glacis of a citadel and the first houses of the town.

ESPOUSE', *v. a.* } Fr. *espouser*; Ital. *sposare*; Port. *esposar*; Lat.
ESPOUS'AL, *n. s.* } *sponsare*, *spondere*, to promise, from *sponte*, freely; because he who promises does it freely, or of his own accord. To contract or promise marriage; to marry: hence to adopt, maintain, or defend: espousal is more frequently used in the plural, as the marriage contract consists of mutual promises.

Deliver me my wife Michal, which I *espoused to* me. 2 *Samuel.*

Lavinia will I make my emperess,
And in the sacred Pantheon her *espouse*. *Shakspeare.*

In gratitude unto the duke of Bretagne, for his former favours, he *espoused* that quarrel, and declared himself in aid of the duke. *Bacon's Henry VII.*

The ambassador put his leg, stript naked to the knee, between the *espousal* sheets; that the ceremony might amount to a consummation. *Id.*

He had received him as a suppliant, protected him as a person fled for refuge, and *espoused* him *with* his kinswoman. *Bacon.*

With flowers, garlands, and sweet smelling herbs,
*Espoused* Eve decked first her nuptial bed. *Milton.*

They soon *espoused*; for they with ease were joined,
Who were before contracted in the mind. *Dryden.*

Their gods did not only interest themselves in the event of wars, but also *espoused* the several parties in a visible corporeal descent. *Dryden's Juvenal. Dedication.*

I know it is not unusual to find a multitude of texts heaped up, for the maintaining of an *espoused* proposition; but in a sense often so remote from their true meaning, that one can hardly avoid thinking that those who so used them either sought not, or value not, the sense. *Locke.*

The righteousness of the best cause may be overbalanced by the iniquities of those that *espouse* it. *Smalridge.*

You have made the hypothesis valuable by *espousing* it yourself; for, had it continued Mr. Hobbes's, nobody would have minded it. *Spectator.*

The cause of religion and goodness, which is the cause of God, is ours by descent, and we are doubly bound to *espouse* it. *Atterbury.*

If her sire approves,
Let him *espouse* her to the peer she loves. *Pope.*

But several noblemen, of the greatest distinction having, about this time, openly *espoused* their principles, they were no longer under the necessity of acting with the same reserve; and with more security and encouragement, they had likewise greater success. *Robertson. History of Scotland.*

Not so when winter scowls. Assistant Art
Then acts in Nature's office, brings to pass
The glad *espousals*, and ensures the crop. *Cowper.*

ESPOUSALS, among the Jews, were either by writing, or by a piece of silver given and received, or by cohabitation. Among the Greeks after the parents and friends of the young couple had finished their negociation, the couple themselves pledged their faith to each other, the man swearing that he would be constant and true, the woman that she would marry him, and make him master of all she had. Then they ratified their agreement by a kiss and joining right hands. Among the Romans the espousals consisted in an engagement of friends on both sides, whether absent or present, in public or without witnesses. But the common way was by writings drawn up by common consent, and sealed by both parties; the man also sent a ring to the woman, consisting of iron and without a stone.

ESPREMENIL (James Duval d'), was born in Pondicherry, and became counsellor of the parliament of Paris, and in 1789 deputy from the nobility to the states-general. He first distinguished himself against M. de Lally Tolendal, on the attempt of the latter to obtain a reversal of the attainder of his father, count Lally, beheaded by Louis XV. D'Esprémenil early entertained the project of restoring to France the states-general; and at the sitting of the parliament, November 19th, 1787, he spoke with great effect in favor of that scheme. Renewing his animadversions on the 3rd of May, 1788, he was seized and banished to the isle of St. Margaret. Being recalled to Paris, he was nominated a deputy to the states-general, when he defended the monarchy against innovators with as much warmth as he had before opposed the oppressive measures of the ministry. When, after his speech against the re-union of the different orders, he saw the minority of the nobles about to leave the chamber, he exclaimed: 'We are on the field of battle: the cowards desert us!

but let us close our ranks and we are still strong enough.' In September, 1790, he made the singular proposition to the national assembly to re-establish the monarchy. He afterwards fell a victim to revolutionary fury. On the 27th of July, 1792, he was assailed by a band of armed men, by whom he was badly wounded, and from whom he narrowly escaped with his life. His friends then entreated him to leave France, but he refused, saying he ought to await the consequences of a revolution which he had planned. He was at length condemned by its bloody tribunal, and suffered on the scaffold in 1793; on which occasion he called out to Pethion, mayor of Paris, 'Beware of your own fate! I, too, was once the idol of the people.' He was at this time forty-eight years of age.

ESPRIT (James), one of the French literati of the seventeenth century, was born at Besiers in the year 1611. Having passed through his initiatory studies, he was introduced to the duke de la Rochefoucault, who procured him the patronage of the chancellor Seguier, from whom he obtained a pension from his own private purse, and another of 2000 livres, on an abbey; together with a brevet of counsellor of state. He afterwards incurred the displeasure of the chancellor, and withdrew to the seminary of St. Magloire, where he became acquainted with the prince of Conti, and had serious thoughts of entering the church. This prince was so charmed with his conversation, that he gave M. Esprit handsome apartments in his own hotel, and a pension of a thousand crowns. In a short time Esprit gave up all thoughts of the ecclesiastical life, and determined to marry. On this occasion he received some handsome presents from the prince, to whom he became so much attached that he followed him, in 1766, to his government of Languedoc, and became his most confidential friend and adviser. At the death of his patron, he devoted the whole of his time to the education of that prince's children, and died at the place where he was born, in 1678. He left behind him Paraphrases on some of the Psalms; and a treatise, entitled La Fausseté des Vertus humaines, in two volumes, which was published the same year in which he died, and was intended as a commentary on the maxims of his patron the duke de la Rochefoucault. By the abbé Olivet he is supposed to have been the translator of Pliny's panegyric on Trajan. Esprit was a member of the French Academy.

Esprit (St.), a town of France, in the department of the Landes, on the Adour, opposite Bayonne; and twenty-five miles south-west of Dax. Population 5100.

ESPY', *v. a.* & *v. n.* } Fr. *espier*. See Spy.
Espi'al, *n. s.* } To see at a distance: hence to look at attentively, or minutely; to discover by examination; to watch.

As one of them opened his sack he espied his money. *Genesis.*

Moses sent me to *espy* out the land, and I brought him word again. *Jos.* xiv. 7.

Stand by the way and *espy*; ask him that fleeth, What is done? *Jer.* xlviii. 19.

Those four garrisons issuing forth at such convenient times as they shall have intelligence, or *espial* upon the enemy, will drive him from one side to another. *Spenser on Ireland*

On the top of all I do *espye*
The watchman wayting tidings glad to heare
That, O my parents! might I happily
Unto you bring, to ease you of your misery.
*Spenser. Faerie Queene.*

Eftsoones that dreadful dragon they *espyde*,
Where stretched he lay upon the sunny side
Of a great hill. *Id.*

Few there are of so weak capacity but publick evils they easily *espy*; fewer so patient as not to complain, when the grievous inconveniences thereof work sensibly smart. *Hooker.*

As he marched along,
By your *espials* were discovered
Two mightier troops. *Shakspeare.*

*'Spials* have informed me,
The English in the suburbs close entrenched,
Went through a secret grate. *Id. Henry VI.*

She had some secret *espials* to look abroad for graceful youths, to make Plantagenets.
*Bacon's Henry VII.*

If the Israelites had gone on to Canaan without inquiry, their confidence had possessed it; now they send to *espy* the land, six hundred thousand of them never lived to see it. *Bp. Hall's Contemplations.*

He who before he was *espied* was afraid, after being perceived was ashamed, now being hardly rubbed upon, left both fear and shame, and was moved to anger. *Sidney.*

He had the skill, when Cunning's gaze would seek
To probe his heart and watch his changing cheek,
At once the observer's purpose to *espy*,
And on himself roll back his scrutiny. *Byron.*

ESQUILLÆ, the Esquiline, or Esquilinus Mons, in ancient geography, one of the seven hills of Rome, which Varro will have to consist of two, viz. Cispius and Oppius. The name was softened from Exquilinus, and this from Excubinus, the watch or guard Romulus kept here, from a jealousy he entertained of his colleague Titus Tatius. On the east it reached the city walls and Porta Esquilina (the Esquiline gate) so named from it; on the south the Via Lavicana; on the west the wide valley between mount Coesius and the Palatine; and on the north the Viminal mount. This hill by some of the ancients was called Suburranus, from the street Suburra to the north of it; and styled by the poets Esquilius.

ESQUIMAUX, the aboriginal inhabitants of the coasts of Labrador and Hudson's Bay, North America, agreeing remarkably with the Greenlanders in their customs, manners, and language. Crantz assures us in his History of Greenland, vol. i. p. 262, that the Moravian brethren, who, with the consent and furtherance of Sir Hugh Palliser, then governor of Newfoundland, visited the Esquimaux, on the Labrador coast, found that their language, and that of the Greenlanders, did not differ so much as that of the high and low Dutch. Hearne, in 1772, traced this race farther back, towards that part of the globe, from whence they had originally coasted along in their skin-boats, having met with some of them at the mouth of the Copper-mine River, in the latitude of 72°, and near 500 leagues farther west than Pickersgill's most westerly station in

Davis's Strait. The reader of the third voyage of captain Cook will find them also at Norton Sound, at Oonaleshka, and at Prince William's Sound; that is, nearly 1500 leagues distant from their stations in Greenland, and on the Labrador coast. See AMERICA, NORTH, chap. V.

ESQUIRE. Fr. *escuier*. See SQUIRE and ESCUTCHEON. A title of heraldic dignity next to that of knight. 'Those to whom this title is now of right due, says Blount, 'are all the younger sons of noblemen, and their heirs male for ever: the four esquires of the king's body; the eldest sons of all baronets; so also of all knights of the Bath, and knights bachelors, and their heirs male in the right line; those that serve the king in any worshipful calling, as the serjeant chirurgeon, serjeant of the ewry, master cook, &c., such as are created esquires by the king with a collar of S.S. of silver, as the heralds and serjeants at arms. The chief of some ancient families are likewise esquires by prescription; those that bear any superior office in the commonwealth, as high-sheriff of any county, who retains the title of esquire during his life, in respect of the great trust he has had of the posse comitatus. He who is a justice of the peace has it during the time he is in commission, and no longer. Utter barristers, in the acts of parliament for poll-money, were ranked among esquires.'

What, are our English dead?
—Sir Richard Ketley, Davy Gam, *esquire*.
*Shakspeare.*

*An* ESQUIRE, or SQUIRE, was originally a person who, attending a knight in time of war, carried his shield; whence he was called escuier in French, and escutifer or armiger, i. e. armour-bearer, in Latin. Hotoman says, that those whom the French called esquires were a military kind of vassals, having jus scuti, viz. liberty to bear a shield, and in it the ensigns of their family, in token of their gentility or dignity. But this addition has not, of long time, had any relation to the office or employment of the person to whom it has been attributed, as to carrying of arms, &c., but has been merely a title of dignity, next in degree to a knight. Officers of the king's courts, and of the king's household, counsellors at law, justices of the peace, are only esquires in reputation: and even Irish peers and all foreign noblemen, as well as the eldest sons of British peers, though commonly entitled lords, are only esquires in law, and must be so named in all legal proceedings. In late acts of parliament for poll-money, many persons, commonly reputed to be wealthy, were ranked among the esquires of this kingdom. There is a general opinion, that every gentleman of landed property who has £300 a year, is an esquire, which is a vulgar error; for no money whatsoever, or landed property, will give a man properly this title, unless he comes within one of the above rules. By custom, however, this title, like the Spanish title Don, is given indiscriminately to every gentleman who lives on his private fortune, as well as to rich merchants, and even opulent tradesmen. See GENTLEMAN.

ESQUIRES OF THE KING are such as have that title by creation, wherein the form used is, to put about their necks a collar of SS, and bestow on them a pair of silver spurs, &c.

ESQUIRES OF THE KNIGHTS OF THE BATH are constituted by these knights, each knight of the Bath constituting three esquires, at his installation.

Ess, Charles van, born in 1770, at Warburg, in the bishopric of Paderborn, entered the Benedictine abbey of Huysburg, near Halberstadt, in 1788, where he subsequently became prior; but on the suppression of the abbey, in 1804, he became a parish preacher at this place. In 1811, the bishop of Paderborn appointed him episcopal commissioner, with the full powers of vicar-general in the departments of Elbe and Saal. In this situation, he evinced a great predilection for the Roman see. It is said that he took but little part in the translation of the New Testament which was published under his and his brother's name, and he subsequently disclaimed any coöperation in it. In 1810, he wrote a History of the Abbey of Huysburg; and, at the time of the protestant jubilee, in 1817, a Short History of Religion, which was publicly burnt by the scholars in Halberstadt at the celebration of the festival of the reformation, and which was answered by some scholars in the vicinity. He died Oct. 22, 1824.—His brother, Leander van Ess, Benedictine of the abbey of Marienmunster, in the territory of Paderborn, and, at a later period, a parish priest at Schwalenberg, in the principality of Lippe, and, since 1813, professor extraordinary of theology and preacher at Marburg, also one of the directors of the seminary for teachers at that city, has distinguished himself by his translation of the New Testament, published at Sulzbach, by Seidel. The pope, it is true, has lately prohibited this translation; but, in 1820, a new edition appeared, under the name of Leander only. This translation has had a great influence upon the German Catholics.

ESS'AY, *v. a.* & *n. s.*, ESSAY'ER, ESSAY'ISTS. Fr. *essayer*; Arm. *essai*, from Goth. *sæka*, to examine; whence also our word SEEK. To try; attempt; ascertain the value of (as in matallurgy): hence a first attempt; endeavour; experiment; and a composition of the lighter kind, not formed upon logical rules; an essayer or essayist is a composer of essays.

No conquest she, but o'er herself desired;
No arts *essayed*, but not to be admired. *Pope.*

To the Tatler, in about two months, succeeded the Spectator; a series of *essays* of the same kind, but written with less levity, upon a more regular plan, and published daily. *Johnson. Life of Addison.*

The last paper of the Rambler was published March 2nd, this year; after which there was a cessation for some time of his talents as an *essayist*.
*Boswell's Life of Johnson.*

And wet, and cold, and lifeless at her feet,
Pale as the foam that frothed on his dead brow,
Which she *essayed* in vain to clear (how sweet
Were once her cares, how idle seemed they now!)
*Byron.*

ESSAYING. See ASSAYING.

ESSECK, a fortress and town of Austria, in Sclavonia, situated on the right bank of the Drave, two miles above its influx into the Danube. The inhabitants, about 9000, live chiefly in the

suburbs. The fort, which is at some distance from the town, contains an arsenal, barracks, and other military buildings. The country is marshy and unhealthy. A long wooden bridge and dam traverse the Drave and the adjoining morasses. Forty-eight miles W. N. W. of Peterwardein, and eighty north-west of Belgrade.

ES'SENCE, *n. s.* & *v. a.* }
ESSEN'TIAL, *adj.* & *n. s.* }
ESSEN'TIALLY, *adv.* }
Fr. *essence*; Span. and Port. *essencia*; Ital. and Lat. *essentia*, from *esse*, to be. Being; virtual or formal existence, see the quotation from Watts; species; principal powers or virtues; perfume: used also (improperly) for the cause of being; and, rather fantastically, for to perfume or scent. Essential is, necessary to the being or constitution of a thing: hence important in a high degree; pure; simple: as a substantive it is used synonymously with essence, and also for a chief or important point or consideration.

The visible church of Jesus is one in outward profession of those things which supernaturally appertain to the very *essence* of Christianity, and are necessarily required in every particular Christian man. *Hooker.*

She is my *essence*; and I leave to be,
If I be not by her fair influence
Fostered, illumined, cherished, kept alive. *Shakspeare.*

He that loves himself,
Hath not *essentially*, but by circumstance,
The name of valour. *Shakspeare. Henry VI.*

Here be four of you, as differing as the four elements; and yet you are friends: as for Eupolis, because he is temperate, and without passion, he may be the fifth *essence*. *Bacon.*

The discipline of our church, although it be not an *essential* part of our religion, should not be rashly altered, as the very substance of our religion will be interested in it. *Id.*

One thinks the soul is air; another, fire;
Another, blood diffused about the heart;
Another saith, the elements conspire,
And to her *essence* each doth give a part. *Davies.*

'But pause, my soul! and study ere thou fall
On accidental joys, th' *essential*.—
—And what *essential* joy canst thou expect
Here upon earth? *Donne.*

True repentance is a very severe magistrate, and will strip off all that shelter and covering which would make the stripes to be less sensibly felt and reckons shame an *essential* part of the punishment. *Clarendon.*

All arts acknowledge, that then only we know certainly, when we can define; for definition is that which refines the pure *essence* of things from the circumstance. *Milton.*

For spirits when they please,
Can either sex assume, or both; so soft
And uncompounded is their *essence* pure;
Not tied or manacled with joint or limb. *Id.*

As far as gods and hea enly *essences*
Can perish. *Milton's Paradise Lost.*

His utmost ire to the height enraged,
Will either quite consume us, or reduce
To nothing this *essential*. *Id.*

In such cogitations have I stood, with such a darkness and heaviness of mind, that I might have been persuaded to have resigned my very *essence*. *Sidney.*

Body and spirit are *essentially* divided, though not locally distant. *Glanville.*

Judgment s more *essential* to a general,
Than courage. *Denham's Sophy.*

The plague of sin has even altered his nature, and eaten into his very *essentials*. *South.*

I could wish the nature of a spirit were more unknown to me than it is, that I might believe its existence, without meddling at all with its *essence*. *More's Divine Dialogues.*

From that original of doing good that is *essential* to the infinite being of our Creator, we have an excellent copy transcribed. *Sprat.*

Knowledge is that which, next to virtue, truly and *essentially* raises one man above another. *Addison's Guardian.*

The husband rails, from morning till night, at *essenced* fops and tawdry courtiers. *Id. Spectator.*

The juice of the seed is an *essential* oil or balm, designed by nature to preserve the seed from corruption. *Arbuthnot.*

This power cannot be innate and *essential* to matter; and if it be not *essential*, it is consequently most manifest it could never supervene to it, unless impressed and infused into it by an immaterial and divine power. *Bentley.*

Our humble province is to 'tend the fair;
To save the powder from too rude a gale,
Nor let th' imprisoned *essences* exhale. *Pope.*

And if each system in gradation roll,
Alike *essential* to the amazing whole,
The least confusion but in one, not all
That system only, but the whole must fall. *Id.*

A great minister puts you a case, and asks your opinion; but conceals an *essential* circumstance, upon which the whole weight of the matter turns. *Swift.*

The sort of definition, which is made up of a mere collection of the most remarkable parts or properties, is called an imperfect definition, or a description; whereas the definition is called perfect, when it is composed of the *essential* difference, added to general nature or genus. *Watts.*

The hand of him here torpid lies
That drew the *essential* form of grace;
Here closed in death the attentive eyes,
That saw the manners in the face.
*Johnson's Epitaph for Hogarth.*

A knowledge of the laws of our country, is a highly useful, and I had almost said *essential*, part of liberal and polite education. *Blackstone.*

And what the stoicks taught of resignation to the will of heaven, or to the decrees of fate, was so repugnant to some of their other tenets, that little good could be expected from it. But of every Christian virtue piety is an *essential* part. *Beattie.*

The love-sick Beauties lift their *essenced* brows,
Sigh to the Cyprian queen their secret vows,
Like watchful Hero feel their soft alarms,
And clasp their floating lovers in their arms.
*Darwin*

I ask not
For valor, since Deformity is daring.
It is its *essence* to o'ertake mankind
By heart and soul, and make itself the equal,
Aye, the superior of the rest. *Byron.*

ESSENCE, in metaphysics, is that which constitutes the particular nature of each genus or kind, and distinguishes it from all others; being nothing but that abstract idea to which this name is affixed, so that every thing contained in it is essential to that particular kind. This Mr.

Locke calls the nominal essence; in contradiction to the real essence, or constitution of substances, on which this nominal essence depends. Thus the nominal essence of gold is that complex idea the word gold stands for; as implying a body, yellow, weighty, malleable, fusible, and fixed; but its real essence is the constitution of its insensible parts, on which these qualities and all its other properties depend, which is wholly unknown to us.

ESSENES, or ESSENIANS, in Jewish antiquity, one of the three ancient sects among that people. Some suppose they took their rise from that dispersion of their nation which took place after the Babylonish captivity. They allowed a future state, but denied the resurrection of the dead; and they maintained that rewards and punishments extended to the soul only, considering the body as a mass of malignant matter, and the prison of the immortal spirit. The greatest part of them considered the law of Moses as an allegorical system of spiritual and mysterious truth, and renounced all regard to the outward letter in its explanation. They paid the highest regard to the moral precepts of the law, but neglected the ceremonial, excepting what regarded personal cleanliness, the observation of the sabbath, and making an annual present to the temple at Jerusalem. Their way of life was very singular: they did not marry; but adopted the children of others, whom they bred up in the institutions of their sect; they despised riches, and had all things in common, and never changed their clothes till they were entirely worn out. When initiated, they were strictly bound not to communicate the mysteries of their sect to others; and, if any of their members were found guilty of flagrant crimes, they were expelled. Pliny tells us, that they dwelt on the west side of Asphaltites; and that they were a solitary kind of men, living without women or money, and feeding upon the fruit of the palm tree: he adds, that they were constantly recruited by new comers, whom the surges of ill fortune had made weary of the world; in which manner the sect was kept up for several thousands of years, without any being born among them. Philo mentions two classes of Essenes, one of which followed a practical institution, the other a professed theoretical institution. The latter, who were called Therapeutæ, placed their whole felicity in the contemplation of the divine nature. Detaching themselves entirely from secular affairs, they transferred their property to their relations and friends, and retired to solitary places, where they devoted themselves to a holy life. The principal society of this kind was formed near Alexandria, where they lived not far from each other in separate cottages, each of which had its own sacred apartments, to which the inhabitants retired for the purpose of devotion.

ESSENTIAL OILS are such as are really contained in a plant, and are drawn from it by distillation in an alembic with water; they are thus called in contra-distinction to empyreumatic oils, which are raised by a naked fire without water.

ESSENTIAL QUALITIES of bodies are those which are inseparable from them in all their changes and alterations, as extension, figure, number, &c.

ESSEQUIBO. See DEMERARA, and ISSEQUIBO.

ESSEQUIBO, a river of what formerly was Dutch Guiana, is twenty miles broad at its embouchere, but of difficult navigation. Banks of sand run in different directions across the mouth, where are three islands, namely, Leguan, Walkenaam, and Tiger island, which separate it into four channels. Above these there is a succession of islands, extending up the river about twenty-five or thirty miles. The tide is felt about 100 miles up the stream.

ESSEQUIBO, once a Dutch, but now a British settlement, extends along the banks of the above river, and grows cotton, coffee, cocoa, and sugar. We have noticed its political history, and general statistical features, under AMERICA, SOUTH, par. 206—220. See also DEMERARA.

ESSEX (Robert Devereux, second earl of), a distinguished personal favorite of queen Elizabeth, was born in the year 1567 at Netherwood, in Herefordshire, the seat of his father, the first earl, Walter; who died in 1577. He left his heir under the guardianship of Cecil, lord Burleigh, who sent him to Trinity College, Cambridge, at twelve years of age, under the care of Dr. Whitgift, afterwards archbishop of Canterbury. At the age of seventeen he was introduced at court, and accompanied the earl of Leicester in 1585 to Holland. This nobleman had married his mother, and young Devereux so much distinguished himself under his auspices, at the battle of Zutphen, as to be created a knight banneret in the camp. On his return home he was made master of the horse, in the place of the earl of Leicester, who was advanced to the post of high steward; and in 1588 he accompanied the queen to Tilbury, to resist the Spanish invasion, and was there decorated with the order of the garter. In 1589 he joined, without leave of the queen, an expedition under the conduct of Sir John Norris and Sir Francis Drake, for the purpose of restoring Don Antonio to the throne of Portugal: and, while skirmishing in the neighbourhood of Lisbon, challenged, by the sound of the trumpet, the governor, or any person of equal quality with himself, to single combat. Elizabeth expressed herself at first very indignant at this erratic conduct of the earl; but she was soon reconciled, and bestowed upon him some considerable grants of land. Scarcely had this momentary cloud passed over him, when he again incurred the queen's displeasure, by marrying the widow of Sir Philip Sydney. This, however, with a disposition capricious as his own, she also soon forgave; and lord Essex was sent in 1591 with an army of 4000 men to the assistance of Henry IV. of France, then fighting against the league. He assisted in the siege of Rouen, but effected nothing of consequence. He now however retained the queen's favor steadily for some years. She created him a privy counsellor, and in 1596 he was appointed, in conjunction with the lord high admiral Howard, commander of a very successful expedition to the coast of Spain: on his return he was made master-general of the

ordnance. On peace with Spain being proposed, Essex insisted that the queen should listen to no terms of accommodation, and pressed his views on the council with considerable haughtiness: when his guardian, lord Burleigh, is said to have drawn a prayer-book from his pocket, from which he read to Essex the too prophetic warning—'Men of blood shall not live out half their days.' On the death of Burleigh he succeeded him in the chancellorship of Cambridge: and soon after, at a private council which was called to determine upon a proper governor to be sent to Ireland, he had a serious difference with the queen. On the dispute becoming warm, Essex, unable to persuade his sovereign, is said, contemptuously to have turned his back upon her; when, provoked at his insolence, she bade him 'retire and be hanged,' accompanying her command with a blow on the side of his face. The favorite, thrown off his guard, instantly clasped his sword, and swore he would not put up with the affront. He withdrew in anger, and for some time seemed to set the queen's displeasure at defiance, but at length he submitted, and was so far restored to favor, that he was himself appointed governor of Ireland, 'the cursedest of all islands,' as he still ventured to call it in his letters to the queen. In his absence his enemies at court were not idle: he was currently reported to have reflected on the queen's age and infirmities, and to have become secretly connected with the king of Scotland. He soon, therefore, resolved to return to vindicate himself: and, arriving unexpectedly at the court, threw himself at Elizabeth's feet, entreating her protection. She received him with apparent cordiality, but he was soon after committed to private custody, and the exercise of his public employments suspended. It was alleged that he had indulged himself in some freedoms of speech respecting the queen, which she was neither likely to forget or pardon: one was, 'That she grew old and cankered, and that her mind was become as crooked as her carcass.' It was also said that, in his correspondence with the king of Scotland, the object was to procure a public declaration of his right of succession to the English throne, and that he would have engaged his friend, lord Mountjoy, deputy of Ireland, to bring over troops to compel that measure. Still he sufficiently possessed the personal favor of Elizabeth to have been able, with a prudent temper, to overcome all his difficulties; but he rashly encouraged, if he did not originate, a conspiracy to seize the queen's person, and remove his enemies from her councils. Elizabeth however received tidings of the plot, and sent Egerton, the lord-keeper, and other persons of distinction, to expostulate with him. These he had the rashness to detain as prisoners, whilst the earl and his friends went into the city (where he flattered himself he was popular) to raise the inhabitants. But here he was bitterly disappointed; instead of meeting with friends, he was proclaimed a traitor, and the streets were barricadoed against the return of his party. Making his way to the river, therefore, he returned to his house in the Strand in boats, but was soon invested by the queen's forces, and obliged, with all his principal adherents, among whom was the earl of Southampton, to make an unconditional surrender. He was now committed to the Tower, found guilty by a jury of peers, and received sentence of death. The queen is said long to have hesitated as to signing the warrant for his execution, but was persuaded by his enemies that he wished to die, and, considering his silence insulting or obstinate, she at length signed it, and the earl was executed within the Tower on the 25th of February, 1601. A story rejected by Dr. Lingard, but which rests on what most others of our historians have thought tolerably good evidence, is told concerning a ring sent by the earl to the queen during his confinement; which ring, in the height of his favor, he had received as a pledge, on the return of which, she would pardon any future offence. He is said to have entrusted this ring to the countess of Nottingham, his relation, but the wife of his enemy, the admiral, who would not suffer her to deliver it, by which the queen's clemency was frustrated. It is added that, upon her death-bed, the countess having confessed the secret to the queen, the latter was greatly agitated, and told her 'That God might forgive her, but she never could.'

Essex suffered in the thirty-fourth year of his age: and having exhibited together with many wild, ambitious, and violent traits of character, much that was estimable, both in public and private life. He was of an open, brave, and generous disposition: of a cultivated mind; and the decided friend of literature. He gave an estate to the ungrateful Bacon, patronised Wotton, and erected a monument to Spenser.

Essex (Robert Devereux, third earl of), son of the preceding, and born in 1592, was at the period of his father's death, or soon after, entered at Merton College, Oxford, under the care of the warden, Henry Saville, who had been his father's particular friend; and James I., almost immediately upon his succession to the throne, restored this youth to almost all his hereditary honors. He already evinced his father's high spirit, in a quarrel which he had with prince Henry. Some dispute arose between them at tennis; when the prince calling his companion 'the son of a traitor,' he retaliated by giving him a severe blow with his racket; and the king was obliged to interfere to restore peace. At the age of fourteen young Essex was betrothed to lady Frances Howard, who was still younger: but he immediately set out on his travels, and during his absence the affections of his wife were estranged from him, and fixed upon the king's favorite, Carr, afterwards earl of Somerset. The consequence was a suit instituted against the husband for impotency, in which the king, to his disgrace, interfered, and which ended in a divorce. The earl of Essex now retired to his country seat, and spent some years in a rural life. Being wearied however of a state of inaction, he joined the earl of Oxford in the year 1620, in a military expedition to the Palatinate, where they served with companies of their own raising, under Sir Horatio Vere. In the following year they served in Holland, under prince Maurice. The next winter they returned to England, and lord Essex appeared in parliament in the ranks of the opposition. He was of course not favorably received

at court, and shortly after we find him commanding a regiment, raised in England for the United States. On the accession of Charles I., he was employed as vice-admiral in an unsuccessful expedition against Spain. In 1626 he made a third campaign in the Low Countries, and shortly after married the daughter of Sir William Paulet. He now courted popularity among the Puritans, and the officers of the army. He was however still employed by the king in various services; but, when the measures of that monarch forced the court to retire from the metropolis, lord Essex pleaded his obligation to stay and attend in his place as peer of the realm. This fixed him in opposition to the king, and in July, 1642, he accepted the post of general of the parliamentary army: and opposed the king in person at the battle of Edge-hill. After this he was occasionally successful in other instances, but, though treated with external respect, he had not the entire confidence of the ruling party, and the self-denying ordinance (see CROMWELL) threw him out of the command. Unwilling, however, to lose his services altogether, the parliament voted that he should be raised to a dukedom, and be allowed £10,000 per annum, to support that dignity. Neither of these resolutions was carried into effect, and the earl died suddenly, September 14th, 1646, when the parliament directed a public funeral for him, at Westminster Abbey. With him the title of Essex became extinct.

ESSEX, one of the eastern maritime counties of England, is bounded on the east by the German Ocean; on the west by the rivers Lea and Stort, with a part of Hertfordshire; on the north by the river Stour, and part of Cambridgeshire; and on the south by the Thames. Its extent from east to west is about sixty miles, from north to south fifty; its circumference about 226 miles, containing nearly 1,240,000 acres. Its divisions are two-fold: natural and artificial, the first consisting of continent and islands; the latter of hundreds, towns, parishes, and hamlets. The islands lie bordering partly on the German Ocean, and partly on the Thames. The first and most valuable to the east is the island of Mersey, eight or ten miles south of Colchester. The islands towards the south-east, in the hundred of Rochford, are Foulness, Wallasea, Potten, Havengore, and New England, contiguous to each other. The remaining island, going towards the south, is Canvey, surrounded by branches of the river Thames, and situated nearly at its mouth. There are fourteen hundreds, five smaller districts called half-hundreds, and one royal liberty, containing in all 415 parishes, with twenty-one market towns. This county is in the diocese of London, and the province of Canterbury, and is included in the home circuit. It received its name from its situation, in contradistinction to the districts occupied by the West and South Saxons. They called it East Deaxa and East Dexseire, which were changed by the Normans into Exssesa. At the time of the Roman invasion it was inhabited by the people subsequently called Trinobantes. On the subdivision of this island by the Romans this county formed part of the province named Flavia Cæsariensis. In the Heptarchy it formed a distinct kingdom.

In the popular sense of the word, the climate of Essex is mild and genial. Its northerly and easterly winds, however, are very pernicious both to animals and vegetables; and agues are prevalent, notwithstanding the practice of draining and the highly improved cultivation of the lands. The surface is generally very flat and open. Indeed, Essex composes part of that tract of country on the eastern side of England, which forms the largest connected space of level ground in the island; not one lofty eminence or rocky ridge being found in several contiguous counties. The surface of this county, however, is not totally flat, it having many gentle hills and dales. The most level tracts are those of the southern and eastern hundreds.

The most beautiful part of Essex, without the addition of a river, is in the liberty of Havering. From Romford to Brentwood is a fine country; but the more striking scenes are not within view of the road. From Dagenham to the earl of St. Vincent's, who commands a portion of the fine park of Mr. Towers, the country is truly beautiful. From Thorndon, Lord Petre's, to Epping, is all nearly of this description, a perpetual variety of undulation thickly wooded with much fine timber. The fields generally offer a verdure refreshing to the eye; and gentlemen's houses are thickly strewed in every direction. Between Hockley and Raleigh there is a very beautiful view of a rich vale, bounded by distant higher grounds; the whole, a scene to the eye of rich cultivation well wooded Landon Hill commands the greatest and finest view in the county: the Thames is seen distinctly for many miles, and the distant hills of Kent terminate the view with an interesting outline; it exceeds the view from Danbury, though that also is a striking one. The high lands at Purfleet, formed by a chalk cliff, without the intervention of marsh, offer a scene not common on the Essex side of the Thames: it is full of business, shipping, and animation, always an agreeable prospect when mixed with rural features.

South End, now a favorite watering place, depends for beauty, as the scenes on tide rivers necessarily must, on the moment of view being high or low water. The river here is five miles wide; the highlands of Sheppey and the coast of Kent are distinctly seen; and opposite is the mouth of the Medway. The cliff, on which the terrace at South End is built, is high enough to command the whole, and the broken woodland shore that sinks to the water's edge gives to it an outline of foliage.

A finer country is no where to be seen than the banks of the river Stour from Shoebury to Harwich: the vale through which the river glides has great variety of breadth and features; and the bounding hills in all directions offer rich scenes of cultivation; towns, villages, steeples, farms, and woods are intermixed, and form a succession of landscapes extremely pleasing. The animated as well as decorated scene at Mistley, is at high water, singularly beautiful. From the summit of Jarvis Hill, near Barking, a most delightful prospect is obtained over the river Thames, which is here seen to singular advantage, spreading its expansive bosom for many miles in extent, con-

tinually enlivened by the numerous vessels constantly navigating this important portion of the river, while the scene is rendered truly enchanting by the broken range on the coast of Kent, the whole undulating surface, clothed with the softest verdure, and bespangled with flourishing villages, forming a sylvan back-ground to the view.

By much the larger portion of the soil, extending diagonally quite across the county, from Walthamstow and West Ham on the Middlesex border to the Suffolk border, near Clare in that county, consists of various loams. This district contains 681 square miles. The variety of soils in this district is so great as to prevent the possibility of any accurate yet brief view of them. Clayey soils are found in three patches of land, the largest of which is on the borders of Suffolk and Cambridgeshire, between Saffron Walden west; and a little beyond Tilbury east, in this county; and from near Lindsell south, to beyond Sturmer north, containing 222 square miles. The fertile loams run along the entire borders of Kent, the Thames mouth, and the German Ocean as far as Harwich, making several indentations into the interior of the county on the eastern side. They contain 255 square miles. The chalky district, forty-five square miles, is an unshapen tract, west north and south of Saffron Walden, particularly west of that town. Mr. Young, in his Agricultural Report, has denominated that tract of land which surrounds Colchester in nearly a circular form, embracing 255 square miles, a turnip loam. It is a dry sandy and gravelly loam, perfectly well adapted to the culture of that plant, with but few exceptions. An extensive district, containing 156 square miles, consists of a crop and fallow clay. It is a triangular tract, the base of which extands from near the northern extremity of Epping Forest, south-west, to Saffron Walden north. This is a strong, wet, heavy, reddish, or brown loam, upon a whitish clay marl bottom; adhesive, which will yield nothing without draining, and very little with it. Speaking of the soil of this county generally, Speed says, that it is rich and fruitful, though in some places sandy and barren; yet so that it never frustrates the husbandman's hopes, or fills not the hands of her harvest laborers; but in some parts so fertile, that after three years glebe of saffron, the land, for eighteen more, will yield plenty of barley, without either dung or other fattening earth. This coloring is certainly too high for modern times. But all its grain is of good quality, and its wheat obtains the best prices at Mark Lane. This county is distinguished for its skilful agriculture.

The principal rivers are the Colne, the Blackwater or Pont, the Chelmer, Crouch, Ingerbourn, Roding, and Cam. The Thames, Lea, Stort, and Stour, also contribute to the irrigation and fertility of this county. The principal harbour on the coast is that of Harwich, situated on a tongue of land opposite to the united mouths of the Stour and the Orwell. The greater part of Essex is well watered by the many brooks and rivers which run through its vales. The canal from Malden to Chelmsford is of considerable utility to the adjacent villages, and even to parishes at a considerable distance. There are several smaller cuts in different parts. The agricultural produce consists of live stock, chiefly calves, for which Essex has long been proverbial; all sorts of grain and hops, coriander, teazel, caraway and saffron. Potatoes are also grown to a great extent. This county returns eight members to parliament; viz. two for the county, two for Maldon, two for Harwich, and two for Colchester.

We may enumerate the following eminent men born in this county.—Samuel Angier, a nonconformist divine, one of the 2000 ejected ministers. Born at Dedham, 1545. Died 1617. —Thomas Audley, lord chancellor of England. He sat in judgment on Sir Thomas More, and bishop Fisher, in the reign of Henry VIII.—Richard de Badew, the original founder of Clare Hall, Cambridge, born at Badow, towards the close of the thirteenth century.—Dr. Thomas Bourchier, archbishop of Canterbury. He introduced the art of printing into England, in 1464, by bringing over a compositor from Haerlem. He was born at Hawstead. Died 1486.—Sir Anthony Cooke, tutor to Edward VI. Died 1576. He had some very learned and accomplished daughters; one of whom was married to lord Burleigh, another to Sir Nicholas Bacon, a third to Sir John Russel, and a fourth to Sir Henry Killigrew. Lady Russel was a most excellent woman and elegant scholar.—Sir William Dawes, a learned prelate, born near Braintree, 1671. Died 1724.—George Edwards, an eminent naturalist, born at West Ham, in 1693. Died 1773. George Gascoigne, a soldier and a poet of some merit. Died 1577. Dr. John Gauden, bishop of Exeter. He was somewhat of the spirit of the vicar of Bray, vacillating between the king and the parliament, for whom has been claimed the merit of having written the Εικων Βασιλικη; he was born at Mayfield in 1605. Died about 1662.—William Gilbert, a learned physician, who wrote on magnetism. Born at Colchester, 1540. Died 1603.—Sir Harbottle Grimston, a distinguished lawyer. He assisted Burnet in his History of the Reformation. Born at Bradford Hall, near Manningtree, about 1594. Died 1683.—The learned and amiable Joseph Mede, born at Berden in 1586.—Sir Walter Mildmay, the good and virtuous founder of Emanuel College, Cambridge. Born at Chelmsford. Died 1589. &c. &c.

Few minerals are found in Essex; and there are hardly any quarries or masses of rocks. It was formerly noted for woollen manufactures of various descriptions; but of late they have been on the decline. Baize, however, and sacking, are still manufactured in various parts; artificial slates are also made. Near the metropolis large calico-printing manufactories are established; and on the Lea there are mills for making sheet lead. The plaiting of straw has also been introduced with success. A considerable proportion of the inhabitants are employed in the oyster fishery. About 200 vessels, of from eight to fifty tons, are engaged in dredging near the mouths of the Crouch, the Colne, the Blackwater, and in other parts; and, independent of the supplies sent to the metropolis, oysters are exported to

the continent: it is calculated that 20,000 bushels are taken annually. See COLCHESTER. In Foulness Island there are salt water stews for various kinds of fish; and formerly there seem to have been several fish ponds for fresh water fish. In the marshy parts there are decoys for wild ducks. 'Not having before viewed a decoy in the taking season,' says the author of the Agricultural Survey of Essex, 'I had not remarked the practice of each person taking a piece of lighted turf stuck on a table fork in his hand, to approach the decoy; as the wild ducks, it is said, would certainly smell the person without this precaution, and immediately quit the pond. I found the expenses of this decoy (at Mersey) considerable; two men who attend it, who are paid above £100 a year; repairs, nets, rent, &c., amount in all to about £300 a year. Ducks are sometimes so low as 14s. a dozen. The contrivance for taking dun-birds was new to me. At the decoy for them, near Ipswich, there are a series of high poles, to which the nets are attached for taking them in their flight; and these poles are permanent. At this Mersey decoy, to which this bird resorts in large quantities as well as ducks, the net poles are suspended when not at work.'

Antiquities, both of the Roman and the ancient Britons, abound in Essex; such as encampments, tesselated pavements, roads, &c., and there are besides many interesting architectural remains, both military and ecclesiastical.

ESSEX, a county of Massachusetts, thirty-eight miles long, and twenty-five broad, bounded on the south and east by the Atlantic; north and north-west by New Hampshire, and west by Middlesex county. The north part of the county is intersected by Merrimack River: between it and the New Hampshire line are the towns of Ethuen, Haverhill, Almsbury, and Salisbury. It contained twenty-two townships. Salem is the capital.

ESSEX, a county of New Jersey, twenty-five miles long and sixteen broad; bounded on the east by the Pasaick and Newark Bay; south by Middlesex county; north-west by Somerset and Morris counties; and north by Bergen. It is divided into three townships, viz. Newark, Acquacknack, and Elizabeth-town. The soil is very fertile.

ESSEX, a county of Virginia, fifty-five miles long and twelve broad; bounded on the east and north-east by the Rappahannock; south-east by Middlesex; south and south-west by King and Queen county; and north-west by Caroline.

ESSEX, a county of the United States, in Vermont, which contained, in 1816, 3087 inhabitants.

ESSEX, a county of the state of New York, on the western shore of Lake Champlain, erected from Clinton county. It is about forty-three miles long north and south, and forty-one in its average breadth, being nearly square; and is bounded north by Clinton and Franklin counties, east by Lake Champlain, or the state of Vermont, south by Washington county, and west by Montgomery and Franklin counties.

ESSO'INE, *n. s.* Of the Fr *essonié*, or *exonnié*. He that has his presence forborne or excused upon any just cause; as sickness. Allegement of an excuse for him that is summoned, or sought for, to appear and answer to an action real, or to perform suit to a court-baron, upon a just cause of absence. Excuse; exemption.

> From every work he challenged *essoin*,
> For contemplation sake; yet otherwise
> His life he led in lawless riotise. *Faerie Queene.*

ESTAB'LISH, *v. a.*
ESTAB'LISHER,
ESTAB'LISHMENT, *n. s.*
Fr. *etablir*; Span. *establecer*; Ital. *stabilire*, from Lat. *stabilis*, firm, from *sto*, to stand. To fix or settle firmly; to ratify, form, or found. Establisher and establishment follow each of these senses: but the latter word is frequently used in theology for the endowed church of these realms.

I will *establish* my covenant with him for an everlasting covenant. *Gen.* xvii. 19.

Every vow, and every binding oath to afflict the soul, her husband may *establish* it, or her husband may make it void. *Numbers.*

So were the churches *established* in the faith. *Acts.* xvi. 5.

> All happy peace, and goodly government,
> Is settled there in sure *establishment*. *Faerie Queene.*
> Who life did limit by almightye doome,
> Quoth he, knows best the termes *established*. *Id.*

Now come into that general reformation, and bring in that *establishment* by which all men should be contained in duty. *Spenser.*

> We will *establish* our estate upon
> Our eldest Malcolm, whom we name hereafter
> The prince of Cumberland. *Shakspeare. Macbeth.*

He had not the art penned by way of recognition of right; as, on the other side, he avoided to have it by new law; but chose rather a kind of middle way, by way of *establishment*. *Bacon's Henry VII.*

I reverence the holy fathers as divine *establishers* of faith. *L. Digby.*

He appointed in what manner his family should be *established*. *Clarendon.*

The Normans never obtained this kingdom by such a right of conquest, as did or might alter the *established* laws of the kingdom. *Hale's Common Law.*

It is an *established* opinion among some men that there are in the understanding certain innate principles; some primary notions. *Locke.*

Whilst we set up our hopes and *establishment* here, we do not seriously consider that God has provided another and better place for us. *Wake.*

The sacred order to which you belong, and even the *establishment* on which it subsists, have often been struck at; but in vain. *Atterbury.*

Against all this there seems to be no defence, but that of supporting one *established* form of doctrine and discipline. *Swift.*

His excellency, who had the sole disposal of the emperor's revenue, might gradually lessen your *establishment*. *Id.*

His court is immediately *established* in the plenary possession and exercise of its rights. *Franklin.*

Never did a serious plan of amending any old tyrannical *establishment* propose the authors and abettors of the abuses as the reformers of them. *Burke.*

ESTACHAR, ESTAKER, or ISTACHAR, a town of Persia, in the province of Kuzistan, near which are the ruins of the celebrated PERSEPOLIS, which see.

ESTAING (Charles Henry Count d'), a French admiral of the last century, and lieutenant-general of the armies of France. He was born at Ravel in Auvergne, and descended from an ancient family in that province, one of whom had saved the life of Philip Augustus at the battle of Bovines, in the twelfth century. Count d'Estaing began his career by serving in the East Indies under Lally, when he was taken prisoner by the English, and sent home on his parole. Having dishonorably engaged in hostilities again before he had been exchanged, he was, on being again taken, kept a close prisoner at Portsmouth. In the American war he was a vice-admiral, and behaved gallantly at the taking of Grenada. In the Revolution he was (1789) appointed to the command of the national guard at Versailles, and suffered by the guillotine as a counter-revolutionist in 1793, aged sixty-five.

ESTATE', *n. s.* & *v. a.* Fr. *etat*; Span. and Port. *estado*; Ital. *stâto*; Lat. *status*, from *sto*, Gr. *σταω*, to stand. The general interest; standing or universal condition of things; particular condition of life; fortune; possession; rank; and, in an obsolete sense, a person of high rank. Shakspeare, and others of our early dramatists, use the verb for to settle as a fortune, and Pearson for to establish generally.

Herod, on his birth-day, made a supper to his lords, high-captains, and chief *estates* of Galilee. *Mark* vi. 21.

More especially we pray for the good *estate* of the Catholic church; that it may be so guided and governed by thy good Spirit, that all who profess and call themselves Christians, may be led into the way of truth, &c. *Common Prayer.*

She is a dutchess, a great *estate*. *Latimer.*

The highest point outward things can bring unto, is the contentment of the mind; with which no *estate* can be poor, without which all *estate* will be miserable. *Sir P. Sidney.*

Why hath thy queen
Summoned me hither?
—A contract of true love to celebrate,
And some donation freely to *estate*
On the blest lovers. *Shakspeare. Tempest.*

To venture a sure *estate* in present, in hope of a better in future is mere madness. *Raleigh.*

Many times the things adduced to judgment may and tuum, when the reason and consequences thereof may reach to point of *estate*: I call matters of *estate* not only the parts of sovereignty, but whatsoever introduceth any great alteration, or dangerous precedent, or concerneth manifestly any great portion of people. *Bacon's Essays.*

A covetous man makes a hard shift to be as poor and miserable with a great *estate*, as any man can be without it. *Tillotson.*

Who hath not heard of the greatness of your *estate*? Who seeth not that your *estate* is much excelled with that sweet uniting of all beauties? *Sidney.*

Go, miser! go; for lucre sell thy soul;
Truck wares for wares, and trudge from pole to pole,
That men may say, when thou art dead and gone,
See what a vast *estate* he left his son!
*Dryden. Pers.*

Thanks to giddy chance,
She cast us headlong from our high *estate*.
*Dryden.*

Truth and certainty are not at all secured by innate principles; but men are in the same uncertain, floating *estate* with as without them. *Locke.*

Some thought that Christ translated them [the souls of the faithful] into a far more glorious place, and *estated* them in a condition far more happy. *Pearson on the Creed.*

Themistocles, the great Athenian general, being asked whether he would rather choose to marry his daughter to an indigent man of merit, or to a worthless man of *estate*, replied, that he should prefer a man without an *estate* to an *estate* without a man. *Hughes.*

The *estate* his sires had owned in ancient years
Was quickly distanced, matched against a peer's.
Jack vanished, was regretted and forgot:
'Tis wild goodnature's never failing lot. *Cowper.*

ESTATE, in law, signifies the interest that a person has in lands, tenements, or other effects: comprehending the whole in which a person has any property. Estates are either real or personal, otherwise distinguished into freeholds, which descend to heirs; or chattels, that go to executors or administrators. A fee simple is the amplest estate our law admits of. See FEE. Estates are obtained several ways; as, by descent from a father to a son; by conveyance or grant from one person to another; by gift or purchase; or by deed or will. See DESCENT, SUCCESSION, TENURE, &c.

ESTATES, in a political sense, is used either to denote the dominions of a prince, or the general classes into which the people are divided. In Britain, the estates are the king, lords, and commons.

ESTE, an ancient walled town of the Venetian territory, in the Paduan. It is situated at the conflux of the Bacchiglione and Gua, in a delightful country: containing several good buildings, and a population of 6000. Thirteen miles south-west of Padua, and thirty-six east of Mantua.

ESTEEM', *v. a.*, *v. n.* & *n. s.*
ESTEEM'ABLE, *adj.*
ESTEEM'ER, *n. s.*
ES'TIMABLE,
ES'TIMATE, *v. a.* & *n. s.*
ESTIMA'TION, *n. s.*
ES'TIMATIVE, *adj.*
ES'TIMATOR, *n. s.*

Fr. *estime*; Span. and Por. *estima*; Ital. *stima*; Lat. *æstimatio* from *ες* and *τιμαω*, to value. Both esteem and estimate signify to affix a value upon; to calculate; compare; think, or imagine; but the former is applied to thinking of, or valuing highly, or with preference: also, as a neuter verb, to consider, or to value: esteemable and estimable mean valuable; worthy of preference.

When a man shall sanctify his house to the Lord, then the priest shall *estimate* it whether it be good or bad: as the priest shall *estimate* it, so shall it stand. *Lev.* xxvii. 14.

One man *esteemeth* one day above another; another *esteemeth* every day alike. *Rom.* xiv. 5.

I preferred her before sceptres and thrones, and *esteemed* riches nothing in comparison of her. *Wis.* vii. 8.

I shall have *estimation* among the multitude, and honour with the elders. *Id.* viii. 10.

The worth of all men by their end *esteem*,
And then due praise, or due reproach them yield.
*Spenser.*

A knowledge in the works of nature they honour, and *esteem* highly profound wisdom; howbeit this wisdom saveth not. *Hooker.*

Crimes there were laid to his charge many, the least whereof being just, had bereaved him of *estimation* and credit with men. *Id.*

Forasmuch as to understand and to be mighty, are great qualities; the higher that they be, they are so much the less to be *esteemed*, if goodness, also, abound not in the possessor. *Sir P. Sidney.*

I'd love
My country's good, with a respect more tender,
More holy and profound than mine own life,
My dear wife's *estimate*, her womb's increase,
The treasure of my loins. *Shakspeare. Coriolanus.*

Of your brace of unprizable *estimations*, the one is but frail, and the other casual. *Shakspeare.*

I know the gentleman
To be of worth and worthy *estimation*,
And not without desert so well reputed. *Id.*

A pound of man's flesh, taken from a man,
Is not so *estimable* or profitable
As flesh of muttons, beefs, or goats. *Id.*

No man is *esteemed* for gay garments but by fools. *Raleigh.*

In our own *estimation* we account such particulars more worthy than those that are already tried and known. *Bacon.*

Besides, those single forms she doth *esteem*,
And in her balance doth their values try. *Davies.*

Not knowing how to set a true value upon this, (time) is the true cause of the wrong *estimate* they make of all other things. *Clarendon.*

The only way to come to a true *estimate* upon the odds betwixt a publick and a private life, is to try both. *L'Estrange.*

We find in animals an *estimative* or judicial faculty, an appetition or aversation, and loco-motive faculty answering the will. *Hale.*

The error is not in the eye but in the *estimative* faculty, which mistakingly concludes that colour to belong to the wall, which indeed belongs to the object. *Boyle.*

The only way for a rich man to be healthy, is by exercise and abstinence, to live as if he was poor; which are *esteemed* the worst parts of poverty. *Sir W. Temple.*

You lost one who gave hopes of being, in time, every thing that was *estimable* and good. *Temple.*

Both those poets lived in much *esteem* with good and holy men in orders. *Dryden's Fables. Preface.*

Who would not be loved more, though he were *esteemed* less? *Dryden.*

It is by the weight of silver, and not the name of the piece, that men *estimate* commodities and exchange them. *Locke.*

This might instruct the proudest *esteemer* of his own parts, how useful it is to talk and consult with others. *Id.*

Outward actions can never give a just *estimate* of us, since there are many perfections of a man which are not capable of appearing in actions. *Addison.*

Upon a moderate *estimate* and calculation of the quantity of water now actually contained in the abyss, I found that this alone was full enough to cover the whole globe to the height assigned by Moses. *Woodward.*

Where great *esteem* is without affection, 'tis often attended with envy if not with hate. *Dennis.*

To whom can riches give repute and trust,
Content or pleasure, but the good and just?
Judges and senates have been bought for gold,
*Esteem* and love were never to be sold. *Pope.*

What has age, if it has not *esteem*?—It has nothing. *Young*

All gentlemen of fortune are, in consequence of their property, liable to be called upon to establish the rights, to *estimate* the injuries, to weigh the accusations, and sometimes to dispose of the lives of their fellow subjects, by serving upon juries. *Blackstone.*

The English in general seem fonder of gaining the *esteem* than the love of those they converse with; this gives a formality to their amusements. *Goldsmith.*

No man—can pay a more servile tribute to the great, than by suffering his liberty in their presence to aggrandize him in his own *esteem*. *Johnson. Life of Swift.*

You may, indeed, happen to lose the game to your opponent, but you will win what is better, his *esteem*, his respect, and his affection; together with the silent approbation and good-will of impartial spectators. *Franklin.*

There wants some certain rule then, by which every man's knowledge is to be tried, and the value of it estimated. *Mason.*

When ancient opinions and rules of life are taken away, the loss cannot possibly be *estimated*. From that moment we have no compass to govern us; nor can we know distinctly to what port we steer. *Burke*

By this he forms, as pleased he sports along,
His well poised *estimate* of right and wrong;
And finds the modish manners of the day,
Though loose, as harmless as an infant's play. *Cowper.*

Catharine has fled like a dream—
(So vanishes pleasure, alas!)
But has left a regret and *esteem*
That will not so suddenly pass. *Id.*

ESTHER; אסתר, Heb. i. e. secret, or hid; a canonical book of the Old Testament; containing the history of

ESTHER, a Jewish lady, whose great beauty raised her to the throne of Persia; whereby she saved her countrymen from the total extermination planned by the proud Haman, prime minister and favorite of king Ahasuerus. The learned are not agreed who this Ahasuerus was. Archbishop Usher supposes him to be Darius Hystaspis, and Artystona to be Esther. Scaliger makes him the same with Xerxes, and his queen Hamestris to be Esther. Josephus, on the contrary, positively asserts that the Ahasuerus of the Scriptures is the Artaxerxes Longimanus of profane story: and the Septuagint, throughout the whole book of Esther, translate Ahasuerus by Artaxerxes. Most authors agree in this last opinion; and, indeed, the extraordinary kindness showed by Artaxerxes to the Jews, can scarcely be accounted for otherwise than by supposing that they had some powerful advocate like Esther.

Esther was of the tribe of Benjamin, and a descendant from one of those familes which had been carried into captivity by Nebuchadnezzar, king of Babylon, and afterwards settled in the city of Shushan. She was the niece of Mordecai, and her Jewish name was 'Hadassah.' The critics are divided about the author of this book: St. Epiphanius, St. Augustine, and Isidore, attribute it to Ezra; but Eusebius will have it to be of a later date. Some ascribe it to Joachim, high priest of the Jews, and grandson of Josedek; others will have it composed by an assembly, or synagogue, of the Jews, to whom Mordecai wrote letters, informing them of what happened. Esther ix. 29. But the generality of interpreters, He-

brew, Greek, Latin, &c., ascribe the book to Mordecai himself; Elias Levita, in his Mass. Hamum., pref. 3, mentions this opinion as unquestionable.

It is chiefly founded on that passage, chap. ix. ver. 20, where it is said that 'Mordecai wrote these things, and sent letters unto all the Jews, that were in all the provinces, &c.' It is also supposed that queen Esther herself might have some share therein: it being expressed in the same chapter, ver. 29, that Esther and Mordecai wrote a second letter, by the king's authority, to ordain the solemnising a yearly feast, called purim, that is, day of lots, in commemoration of the Jews being delivered from the lots, or sortes, whereby they had been condemned.

Some will have this book to be deuterocanonical, or apocryphal; others contend for its being canonical, as far as chap. x., ver. 3 inclusive, and all the rest deuterocanonical. Of this sentiment are, St. Jerome, De Lyra, Dionysius the Carthusian, Cajetan, and others. The council of Trent turned the scale for its being canonical throughout; so that the matter is determined for the Catholic countries. But the Protestants retain the old opinion, and only admit it as far as the third verse of the tenth chapter; the rest, to the end of the sixteenth chapter, is thrown among the apocryphal books.

ESTHONIA, a country of European Russia, adjoining to Livonia, and extending along the south side of the gulf of Finland. It is upwards of 10,000 square miles in superficial extent; but its population does not exceed 250,000. Revel, the capital, is the only considerable town, and the manufactures are on a very small scale. The hovels of the peasantry are mean, and men and cattle are frequently found under the same roof. In 1804 an imperial ukase issued to ameliorate the condition of the serfs, and another, dated June 1816, pronounced their gradual liberation in the course of fourteen years. The common people speak a dialect of the Finnish; the higher classes German. Corn, hemp, flax, cattle, and seeds, are the principal products; and are all articles of export. Esthonia once belonged to the Teutonic knights, and became an object of contest between Sweden, Russia, and Poland. The treaty of Oliva, in 1660, gave it to Sweden: that of Nystad, in 1721, to Russia, in whose possession it has been ever since. It is sometimes called the government of Revel, and is divided into four circles.

E'STIVAL, *adj.*
E'STIVATOR, *n. s.*
ESTIVA'TION.
} Lat. *astivus.* Pertaining to, or continuing for, the summer: the act of passing the summer.

A grotto is a place of shade or *estivation.* *Bacon.*

ESTO'PEL, *n. s.* Law term. Such an act as bars any legal process.

ESTO'VERS, *n. s.* Law term. Necessaries allowed by law.

ESTOVERS, in law, is used by Bracton, for that sustenance which a man, committed for felony, is to have out of his lands or goods for himself and his family during imprisonment. In stat. 6 Edw. I., it is used for an allowance in meat or clothes. In some manors, the tenants have common of estovers; that is, necessary botes or allowances out of the lord's wood: in which last sense, estovers comprehend house-bote, hay-bote, and plow-bote: so that if a man have in his grant these general words, 'de rationabili estoverio in boscis, &c.' he may thereby claim all three.

ESTOVERS is also used for alimony, which if the husband refuses to pay, there is, besides the ordinary process of excommunication, a writ at common law, de estoveriis habendis, in order to recover it.

ESTRADES (Godfrey), Count of, a French diplomatist of the seventeenth century, was at an early age designed for the profession of arms, and serv'ed under prince Maurice in Holland, with whom he acted as agent of the French court. He was afterwards made a marshal of France, and highly esteemed as a diplomatic character. In the year 1661 he went to England as ambassador extraordinary, where he maintained with spirit the precedence of the crown of France to that of Spain. In the following year he concluded the peace of Breda in Holland. He was intrusted with the negociation for a general peace at Nimeguen, and acquitted himself to the satisfaction of all concerned. He sustained with great credit in various other public trusts; and, in 1685, was nominated governor of the duke de Chartres, but died a few months after his appointment, aged seventy-nine. In 1709 were published Letters, Memoirs, and Negociations, of the Count d'Estrades; an improved edition of the same work appeared at the Hague in 1743, in 9 vols. 12mo.

ESTRANGE', *v. a.*
ESTRANGE'MENT, *n. s.*
} Fr. *estranger.* A compound of STRANGE, which see. To keep at a distance; withdraw; alienate from use or affection.

They have *estranged* this place, and have burnt incense in it to other gods. *Jer.* xix. 4.

Had we not only cut off their corruptions, but also *estranged* ourselves from them in things indifferent, who seeth not how greatly prejudicial this might have been to so good a cause? *Hooker.*

How comes it now, my husband, oh, how comes it,
That thou art thus *estranged* from thyself?
Thyself I call it, being strange to me. *Shakspeare.*

Adam, *estranged* in look, and altered style,
Speech intermitted, thus to Eve renewed.
*Milton.*

We must *estrange* our belief from every thing which is not clearly and distinctly evidenced.
*Glanville's Scepsis.*

See, she weeps;
Thinks me unkind, or false, and knows not why
I thus *estrange* my person from her bed. *Dryden.*

Desires, by a long *estrangement* from better things, come at length perfectly to loath, and fly off from them. *South.*

I do not know, to this hour, what it is that has *estranged* him from me. *Pope.*

His heart, from cruel sport *estranged,* would bleed
To work the woe of any living thing,
By trap or net, by arrow or by sling;
These he detested; those he scorned to wield:
He wished to be the guardian, not the king,
Tyrant far less, or traitor of the field. *Beatti*

Ah, cruel maid, how hast thou changed
The temper of thy mind!

*My heart, by thee from love estranged,*
*Becomes, like thee, unkind.* *Sheridan.*

ESTRE'ES (Francis-Annibal d'), was born in 1573, and educated for the church, in which he, at an early age, had the bishopric of Noyon conferred upon him by Henry IV. When he was twenty-one, however, he resigned his ecclesiastical preferment, on account of the death of his elder brother, and assumed the profession of arms, in which he became distinguished under the title of the marquis De Coeuvres. He was ambassador extraordinary to Switzerland and the princes of Italy in 1614, and created marshal of France in 1626. In 1630 he succoured the duke of Mantua, who was besieged in his capital. In 1636 he was appointed ambassador extraordinary to Rome, a character in which he ably sustained the honor and interests of his master. Being recalled by his sovereign, which he considered as an affront, he refused to appear at court, to give an account of his conduct. He died at Paris in 1670, highly respected, at the great age of ninety-eight years. At the desire of cardinal Richelieu, he drew up Memoirs of the Regency of Mary de Medicis, which was published at Paris, in 12mo., in the year 1660. A relation of the Siege of Mantua, in 1620, and An Account of the Conclave, in which pope Gregory XV. was chosen, in 1621, have also been given to the public from his papers.

ESTRE'ES (Cæsar d'), cardinal, son of the preceding, was born in 1628, and raised to the bishopric of Laon in 1653. He was created cardinal by Clement X. in 1671; and at the death of that pontiff entered the conclave, and managed so as to put off the election five weeks, till the arrival of the body of French cardinals. He was sent into Bavaria to negociate the marriage of the dauphin in 1677; and afterwards went to Rome on other important business. He supported the rights of the crown, and of the Gallican church, in opposition to pope Innocent XI. On his return to France he was rewarded with the abbey of St. Germain des Pres, where he died in 1714, in his eighty-seventh year, greatly regretted. His sister, known as the 'fair Gabrielle,' was for many years the favorite mistress of Henry IV., who first saw her at her father's castle of Coeuvres, 1591. He had three children by her, and, notwithstanding the remonstrances of Sully, the hope of making her his queen was one of his principal inducements in urging on his divorce from Margaret of Valois.' Before, however, he could attain his object, Gabrielle died suddenly, on the 10th of April, 1599, not without a strong suspicion of poison.

ESTREMADURA, an extensive province of Spain, bounded by the frontier of Portugal on the west, Salamanca on the north, Toledo on the east, and Cordova and Seville south. Its length is estimated at 140 miles, its breadth at 120. Rye, wheat, and pasturage, are the chief objects of agriculture here; and the stock of horned cattle, pigs, and goats, is considerable. Sheep, to the amount of 4,000,000 in number, are sent hither every summer from the mountainous provinces, to remain during winter; but most of the raw produce is sent to Seville and Cadiz. Badajos is the chief town; others worth notice are Merida, Lerena, Truxillo, Alcantara, and Placentia. Its chief rivers are the Tagus and Guadiana. There is a solitary woollen manufacture at Bejar. Population 450,000.

ESTREMADURA, a considerable province of Portugal, containing the capital, and extending along the Atlantic to the north and south of Lisbon, being bounded on the north by Beira, and on the east by Alentejo. It is about 140 miles in length, and seventy in breadth. The Tagus enters it on the east, and for many miles forms the boundary between this province and Beira. The climate is mild, and calculated, as well as the soil, for grain culture; which is however but little pursued, nor is pasturage much attended to. The chief products are wine, oil, honey, and fruit; the tract between Lisbon and Abrantes is a perfect garden. Salt is obtained on the coast, and exported from Setubal in considerable quantities. Population 850,000.

ESTREMOS, a strong town of Portugal, in Alentejo, situated in an agreeable neighbourhood, on the Tarra. It consists of the upper and lower towns, the former standing with the citadel on an eminence, the latter in the valley. It is one of the chief fortresses in the kingdom. Population 6500. Twenty-four miles north-east of Evora, forty-eight west of Badajos, and eighty east of Lisbon.

E'STRICH, *n. s.* Commonly written ostrich; *struthiocamelus.* The largest of birds.

To be furious,
Is to be frighted out of fear; and, in that mood,
The dove will peck the *estridge.* *Shakspeare.*

The peacock, not at thy command, assumes
His glorious train; nor *estrich* her rare plumes.
*Sandys.*

E'STUANCE, *n. s.* Heat; warmth. A word rarely found.

Averroes restrained his hilarity, and made no more thereof than Seneca commendeth, and was allowable in Cato; that is, a sober incalescence, and regulated *estuance* from wine. *Browne.*

ESTUA'TION, *n. s.* From Lat. *æstuo.* The state of boiling; agitation; commotion.

Rivers and lakes that want fermenting parts at the bottom, are not excited into *estuations*; therefore some seas flow higher than others. *Browne.*

The motion of the will is accompanied with a sensible commotion of the spirits, and an *estuation* of the blood. *Norris.*

ESTWAITE, ESTHWAITE WATER, a lake of Lancashire, between Hawkshead and Winandermere, two miles and a half long, and half a mile broad. It is nearly intersected by two elevated peninsulæ, one from each side jutting far into it, well cultivated and bordered with trees and coppice wood. It abounds with trouts, pikes, perches, and eels, and has an outlet in the Winander-mere, over which is a narrow stone bridge.

E'STURE, *n. s.* Lat. *æstus.* Violence; commotion.

The seas retain
Not only their outrageous *esture* there,
But supernatural mischief they expire.
*Chapman.*

ESU'RIENT, *adj.* } Lat. *esurio.* Corroding;
E'SURINE. } eating; voracious.

Over much piercing is the air of Hampstead, in which sort of air there is always something *esurine* and acid. *Wiseman.*

ETAMPES, a large town of France, in the department of the Seine and Oise, situated on the Loet or Etampes, which, on its junction here with the Juine, assumes the name of Epone, and becomes navigable. It has leathern and woollen manufactures of some extent. On the 1st of March, 1792, Etampes was the scene of several revolutionary excesses, among others the murder of its mayor. Population 8000. Twenty miles outh of Versailles, and twenty-eight south by west of Paris.

ETAPLES, a sea-port town of France, on the English channel, at the mouth of the Canche, and containing about 1450 inhabitants, whose chief employment is fishing. Eleven miles south-east of Boulogne.

ETAWEH, a district of Hindostan, in the province of Agra, situated between the Jumna and the Ganges. After a good rainy season, it is very productive, yielding all kinds of grain except rice; it also produces sugar, tobacco, and cotton. In the year 1801, it was ceded by the nabob of Oude to the British; and is governed by a judge and collector, subject to the court at Bareilly.

ETAWEH, a fortress, and the capital of the above district, situated on the eastern bank of the river Jumna, which is here very broad. It was formerly the residence of a rajah, and a place of much resort: it is situated on various distinct hills, and has many sand islands.

ETC, a contraction of the two Latin words *et cætera*, which signifies, and so on; and the rest; and others of the like kind.

ETCH', *v. a.* } Ger. *etzen*, from Ger. *eten*,
ETCH'ING, *n. s.* } to eat. To engrave bythe use of aquafortis, which eats into the copper; to nibble, eat or remove the edges: hence to move edgewise. Etching is the art of engraving in this way, or a print thus prepared.

There are many empty terms to be found in some learned writers, to which they had recourse to *etch* out their systems. *Locke.*

When we lie long awake in the night, we are not able to rest one quarter of an hour without shifting of sides, or at least *etching* this way and that way, more or less. *Ray.*

He (Durer) was the first of the Germans, who not only arrived at an exact imitation of nature, but has likewise left no second; being so absolute a master of it, in all its parts, in *etching*, engraving, statuary, architecture, optics, symmetry, and the rest, that he had no equal, except Michael Angelo Buonarrotti. *Pilkington.*

It has formerly been much disputed among the curious, whether Germany or Italy had the honour of giving birth to the invention of *etching*, and with the view of ascertaining this point, the dates of the impressions from the earliest *etching* by Albert Durer and Parmegiano have been assiduously sought for and compared. *Dr. A. Rees.*

ETCH, *n. s.* Sax. eðirc. Written also *eddish* and EARSH, which see. Ground from which a crop has been taken or eaten; or not improbably of similar origin to the foregoing 'etch.' See EAT.

When they sow their *etch* crops, they sprinkle a pound or two of clover on an acre. *Mortimer.*

Where you find dunging of land makes it rank, lay dung upon the *etch*, and sow it with barley. *Mortimer's Husbandry.*

ETCH or ETCHING, *etizen* German, in engraving, is performed on copper and other metals or substances by drawing with a needle inserted in a handle, called an etching needle, on and through a thin ground, which being corroded or bitten by aqua-fortis, forms the lines upon the plate. The tools and substances employed in this free and artist-like mode of engraving are varnishes or grounds of various sorts, both hard and soft, which can be purchased at the color shops; etching needles of various sizes, etching boards, rules, &c. The design is transferred to the ground in the same way as directed for engraving, and then the lines and figures are traced, drawn, or etched through the ground with the needles. See ENGRAVING.

The most eminent artists of different nations who, after Albert Durer, have distinguished themselves by their abilities in etching, and whose works are the fittest examples for the student, in Germany are Jean Guillaume Bauer, born at Strasburg in 1600, and died at Vienna in 1640; he engraved many battle-pieces, capriccios, and historical pieces with great ability; Mathieu Merian, 1661, who excelled in natural history, entomology, &c.; Wenceslas Hollar, 1676, of whom G. Vertue published in London, 1752 and 1759, a description of his works in one volume 4to.; Jonas Umbach, a painter and etcher born at Augsburg in 1624, and died there about 1690, engraved many excellent plates from scripture history; Jean Henri Roos, born at Ottendorf in the Palatinate, in 1631, died at Frankfort in 1680; he excelled chiefly in animals; J. J. de Sandrart, 1698, who engraved after Raffaelle, &c.; Franç. Ettinger, 1702; Phil. Roos, 1705; Fel. Meyer, 1713; Jean Christophe Dietsch, also a landscape painter, born at Nuremburg in 1710, and died in 1769; Pierre Von Bemmel, born at Nuremburg in 1689, and died in the same city in 1723, landscape; Franç de Paule Ferg, born at Vienna in 1689, died in London 1740; G. Phil. Rugendas, born at Augsburgh 1666, died 1742; J. F. Beich, born at Munich 1665, died there in 1748; J. Frey, born at Lucerne 1689, died at Rome in 1760; Thiele, 1752; Wolfgang Kilian, 1759; Phil. Jérôme Brinkmann, born at Spire 1709, died at Manheim in 1761; J. E. Reidinger, born at Ulm in 1698, died at Augsburgh in 1767, celebrated for his animals and hunting pieces; Francois Edmond Weirotter, born at Inspruck in 1730, died at Vienna in 1773; Chret. Guill. Ernest Dietrich, also a painter, born at Weimar in 1712, died at Dresden in 1774; his works are both numerous and excellent; a catalogue of them is printed in Les Melanges Artistiques de M. Meusel; Georges Fred. Schmidt, born at Berlin in 1712, died in the same city in 1775; a catalogue raisonné of whose works, in two parts, was published at Leipsic in 1789; Christ. Louis de Hagedorn, 1780; Jos. Wagner, born at Thalendorf in 1706, died at Venice in 1780; Salomon Gessner, born at Zurich, 1734, died there in 1788; Daniel Chodoweichi, born at Dantzic in 1726; his

works have been described by M. Meusel; Balthasar Antoine Dunker, born at Saal near Stralsund in 1746; M. A. Geyser; H. and C. Guttemberg; Jacques Philippe Hackert, also a landscape painter, born at Prenzlau, in Brandenburgh, in 1737; John Hackert, born at Amsterdam in 1634; George Hackert; Maria Angelica Kaufman, born at Coire in the Grisons in 1747, died at Rome in 1807, also an eminent painter. Her etchings are various and beautiful. Ferdinand Kobell, also a landscape painter, born in 1740; Philip James De Loutherbourg, born at Strasburg in 1740, died at Hammersmith, near London, in 1812, many excellent etchings after his own designs; Jean Meill, born at Antwerp 1599, died at Turin in 1664; Oeser, Rode, Schellenberg, Tischbien, Weisbrodt, Wille, Zingg, &c. &c.

Among the artists of the Netherlands who have rendered themselves celebrated by their etchings are Lucas Sim. Frisius, 1640; Pierre Soutman, 1640; many pieces after Vandyck, Rubens, &c.; Corn. Schut, also a painter, born at Antwerp in 1590, died there in 1660; Jonas Suyderhœf, born at Leyden 1600; J. G. Van Vliet, born in Holland 1608; many spirited etchings after Rembrandt; Ant. Van Dyck, born at Antwerp in 1559, died in London, 1641; Jean Fyt, born at Antwerp in 1625, died in 1644; Jean Both, the celebrated painter, born at Utrecht in 1609, died at Venice in 1650, many very spirited and artist-like etchings, of which there were some fine specimens in the cabinet of M. Paignon Dijonval; P. Potter, born at Enkhuysen in 1625, died in 1654; Pierre Van Sompelen, Jérôme Wittoweck, Jacques Neefs Franç. Sneyders, the celebrated painter of animals, born at Antwerp in 1579, died in 1657; Antoine Waterloo, landscape painter, born at Utrecht in 1618, died there in 1662; Lucas Van Uden, born at Antwerp in 1596, died there in 1662; Corn. Bega, born at Haarlem in 1620, died there in 1664; his etchings are both numerous and excellent; Theodore Van Thulden, 1662; Jean Vischer, born at Amsterdam in 1636, and Corneille Vischer, born at Haarlem in 1610, died in 1673, of whose works a catalogue has been published by Ger Hecquet in 1754; Adrian Van der Velde, born at Amsterdam in 1639, died there in 1672, animals and landscape; Pierre Van Laar, born at Laaren, in Holland, in 1613, died at Haarlem in 1674; Paul Rembrand van Ryn, born near Leyden in 1606, died in 1674; of the numerous etchings of this great artist several catalogues have been published, one in 1751 by Gersaint, another by Helle and Glomy in 1756, to which P. Yver added a supplement; in 1759 Ant. de Burgy published another, but they have been all superseded by the excellent catalogue raisonné of Adam Bartsch, published at Vienna in 1797; Albert Van Everdingen, also a landscape painter, born at Alkmaer in 1621, died there in 1675; Du Jardin Morghen; Jacques Jordaens, the celebrated painter, born at Antwerp in 1594, died there in 1678; R. Stoope born in Holland 1612, died in England 1686; he engraved a set of seven pieces relating to the marriage of Charles II. and Catherine of Portugal; Jean Van der Velde, born at Leyden about 1598, died 1679; Reinier Nooms, called Zeeman, born at Amsterdam in 1612, and died in 1680; he etched many excellent sea pieces; Melch. Kussel, born at Augsburg in 1621, died in 1683; Nic. Berghem, the celebrated painter, born at Haarlem in 1624, died in 1683, of whose works a descriptive catalogue was published by Winter in 1767; Adrian Van Ostade, born at Lubeck in 1610, died at Amsterdam in 1685; Abr. Genoels born at Antwerp in 1638, died in 1685; Herman Saftleven, born at Rotterdam in 1609, died at Utrecht in 1685; Roland Rogmann, born at Amsterdam in 1607, died in 1686; Jean Bischop, known by the name of Episcopius, born at the Hague in 1646, died at Amsterdam 1686; Thomas Wyck, born at Haarlem in 1618, died there in 1686; Jacques Ruysdaal, the landscape painter, born at Haarlem in 1635, died at Amsterdam 1681; David Teniers, born at Antwerp in 1611, died in 1690: Herman Van Swaneveldt, born at Voerden, in Holland, in 1620, died at Rome in 1690; Adrian Van der Cabel, born at Rhyswick in 1631, died in 1695; Ant. Franc. Boudewyns, known by the name of Boudouin, 1700; Corneille du Sart, a painter, engraver in aqua-fortis and mezzotinto, born at Haarlem, in 1665, died there in 1704; Romyn de Hooghe, born at the Hague in 1638, died in 1718; Gerard Lairesse, born at Liege in 1640, died at Amsterdam in 1711; Jean Luycken, born at Amsterdam in 1649, died there in 1712; Jean Gottlieb Glauber, 1726; Jean Van Hughtenburg, painter and etcher of battles, and engraver in mezzotinto, born at Haarlem in 1664, died at Amsterdam in 1733; Jean Punt, also a painter, born at Amsterdam in 1711, died in 1770; Cornelius Ploos Van Amstel, who is also celebrated for his engravings in imitation of drawings, born at Amsterdam about 1730.

The French artists have excelled in the art of etching, which they have brought to great perfection, particularly in finished works upon a small scale. The principal who have succeeded in this spirited and artist-like department of art are Et. Du Perac, born at Paris about 1550, died in 1601; Jacques Callott, born at Nancy in 1593, died there in 1635; his works in sacred and mythological subjects, history, portraits, titles, frontispieces, grotesques, landscapes, &c., are very numerous and much admired; Jean Morin, born about 1612, died in 1665; François Perrier, born at Mâcon in 1590, died at Rome in 1650; Laurent De La Hire, born at Paris in 1606, died there in 1656; Jean Boulanger, born at Troyes in 1613, died in Paris in 1660; Michael Dorigny, who engraved much after Vouet, 1665; Et. Bourdon. Et. Bandet, 1671: Franç. Chauveau, born at Paris in 1620, died there in 1676; Abr. Bosse, born at Tours in 1610, died at Paris in 1678; Gabr. Perelle, born at Paris 1622, died 1680; Franç. Tortebat, born at Paris 1626, died 1690; Israel Silvestre, born at Nancy in 1621, died at Paris in 1691; Claudia Bousonet Stella, 1697; Jean Baptiste Monnoyer, who painted the flowers at the British Museum, born at Lisle in 1635, died at London in 1699; Elisabeth Sophie Cheron, born at Paris in 1648, died there in 1711; Sebastian Le

Clerc, born at Metz in 1637, died at Paris in 1714; a catalogue of this artist's works was published by Jombert in 1774; Antoine Watteau, born at Valenciennes in 1684, died at Paris in 1721; Ant. Coypel, born at Paris in 1661, died there in 1728; Bernard Picart, whose numerous and excellent works have procured him a deservedly great name, was born at Paris in 1673, and died at Amsterdam in 1733; Ch. Nic. Cochin, born at Troyes in 1619, died at Paris in 1686; J. B. Oudry, born at Paris in 1686, died in 1755; Jacques Phil. le Bas, born at Paris in 1708, died in 1782; Pierre Quentin Chedell, born at Châlons, in Champagne, in 1705, died about the year 1762; Jean Moyreau, 1762; A. C. Ph. Comte de Caylus, born at Paris in 1687, died in 1765, known by the number and excellence of his works and his writings on antiquities; Nic. Ch. Silvestre, 1767; Ch. Hutin, born at Paris in 1715, died at Dresden in 1776; J. B. Le Prince, born at Paris in 1733, died in 1781; Ch. Nic. Cochin the younger, born at Paris in 1715, died there 1788; a catalogue of the works of this able artist is published by Jombert, Paris, 8vo. 1770; Laurent J. Cars, born at Lyons in 1702, died at Paris in 1771; Choffart, Flippart, S. Aubin, Demanteau, J. de Longueuil, Marcenay de Ghuy, De S. Non, Denon, Tardieu, De Sève, Pillement, Hibon, Willemin, &c.

Among the Italian artists who have excelled in etching are Agostino Veneziano, who etched many of the designs of Michel Angiolo, Raffaelle, &c., and died in 1514; Franc. Mazzuoli, commonly called Parmegiano, born at Parma in 1504, died at Casal Maggiore in 1540; his etchings, after his own pictures, are numerous and excellent; Marco da Ravenna, died in 1540; Giacomo Robusti, surnamed Tintoret, born at Venice in 1512, died in 1594; Agostino Caracci, born at Bologna in 1558, died in 1602; Annibale Caracci, brother of the last, born at Bologna in 1560, died at Rome in 1609; F. Baroccio, born at Urbino in 1528, died at Rome in 1612; B. Schidone, born at Modena in 1560, died at Parma in 1616; C. Procaccini, born at Bologna in 1546, died at Milan in 1626; F. Villamena, born at Assisi in 1566, di at Rome in 1626; Giacomo Palma, born at Venice in 1544, died in 1628; Raffaelle Sciaminose, born in 1570, died in 1615; Guido Reni, born at Calvenzano, near Bologna, in 1575, died in 1642; Lanfranco, born at Parma in 1581, died at Rome in 1647; Pietro Testa, born at Lucca in 1611, died at Rome in 1648; Guiseppe Ribera, called Il Spagnuoletto, born at Gallipoli in 1593, died in 1656; Giov. Franc. Barbieri, called Guercino, born at Cento in 1590, died at Bologna in 1660; Pietro Santi Bartoli, 1670; Giov. Benedetto Castiglione, born at Genoa in 1616, died at Mantua in 1670; Salv. Rosa, born at Naples in 1615, died at Rome in 1673; Gasp. Dughet, called Le Poussin, born at Rome in 1613, died in 1675; Lucas Giordano, 1705; Carlo Maratti, born at Camerino in 1625; died at Rome in 1713; Pietr. Aquila, 1720; Marco Ricci, born at Belluno in 1689, died at Venice in 1730; J. B. Tiepolo, born at Venice in 1697, died at Madrid in 1770; André Scacciati, 1771, Franc Bartolozzi, Bern. Bellotto, called Canaletti, Fr. Cunego, Piranesi, Volpato, &c. &c.

Among our English artists who have distinguished themselves by the use of the etching needle are Franc. Barlow, who died in 1702; Dan. Marot, 1712; Jon. Richardson, born at London in 1665, died there in 1745; Arthur Pond, born in 1700, died in 1758; William Hogarth, born at London in 1698, died in 1764; of whose numerous and admirable works an account may be found in the Biographical Anecdotes of Will. Hogarth. London, 1766; Rich. Earlom; William Woollet, born at Maidstone in 1735, died at London in 1785; Robert Walker, born in Somersetshire in 1572; James Gammon, born about 1630; Thomas Worlidge, in the style of Rembrandt, born at Peterborough in 1700, died at Hammersmith in 1766; J. B. Chatelain, born in England about 1710; Captain William Bailly, born about 1726; Thomas Gainsborough. born at Sudbury in 1727, died in 1788; Peter Tillemans, James Barry, Paul Sandby, Robert Pollard, James Gilray, the inimitable caricaturist, Robert Dodd, Thomas Vivares, and most of our eminent engravers.

The best works for reference concerning the subject of etching, and of the artists who have practised it, are, among others, mentioned under ENGRAVING. Le Catalogue du Cabinet de M. de Marolles; le Cabinet des Singularités d' Architecture, de Peinture, Sculpture, et Gravure, par Florent Le Conte; Description du Cabinet de M. Lorangere, par M. Gersarit; Le Catalogue du Chevalier de la Roque, by the same author; Le Catalogue raisonné du Cabinet de M. De Fonspertuis, by the same; that of the Cabinet de M. Mariette, par Franc. Basan; Le Catalogue raisonné des Estampes de M. Julienne, par P. Remy; Les Notices générales des Gravures divisès par Nations, suivies d'un Catalogue raisonné d'une Collection choisée d'Estampes, par M. Haber; Le Catalogue du Cabinet du Comte de Praun par Christophe de Murr, 8vo. 1797; Le Catalogue raisonné des principaux Graveurs et de leurs Ouvrages, par Fuesslin; Le Manuel des curieux et des Amateurs des Arts, by the same; Le Dictionnaire des Artistes dont nous avons des Estampes, par le Baron de Heinecken; Cabinet de M. Paignon Dijonval; various periodical works, such as Le Mercure de France, la Bibliothèque et la Nouvelle Bibliothéque des Belles Lettres et des Beaux Arts, en Allemand, les Journaux artistiques publiés. par M. de Murr et M. Meusel. See ENGRAVING.

ETEOCLES, in fabulous history, the eldest son of Œdipus and Jocasta. See CREON. Having reigned one year in Thebes, he refused to give up the crown to his brother, Polynices, according to their mutual agreement. Polynices, resolved to punish such a violation of a solemn engagement, implored the assistance of Adrastus king of Argos. He received that king's daughter in marriage, and was soon after assisted with a strong army headed by seven famous generals. Eteocles chose seven brave chiefs to oppose these, and stationed them at the seven gates of the city. He placed himself against his brother Polynices, and he opposed Menalippus to

Tydeus, Polyphontes to Capaneus, Megareus to Eteoclus, Hyperbius to Parthenopæus, and Lasthenes to Amphiaraus. After much blood had been shed, it was at last agreed between the two brothers that the war should be decided by single combat. Inflamed with the most inveterate fury on each side, they both fell; and it is said that their ashes separated on the funeral pile, as if still sensible of resentment, and hostile to reconciliation.

ETER'NAL, *adj.* & *n. s.*
ETER'NALIST, *n. s.*
ETER'NALIZE, *v. a.*
ETER'NALLY, *adv.*
ETERNE', *adj.*
ETER'NITY, *n. s.*
ETER'NIZE, *v. a.*

French *eternel;* Span. and Port. *eternal;* Ital. *eternale;* Lat. *æternus,* i. e. *æviternus,* from *ævum,* which by insertion of the Æolic *digamma* comes from Gr. *αιων,* i. e. *αει ων,* ever being. Without beginning or end: hence as a substantive applied only with strict propriety, to God: without end, immortal, perpetual, constant: an eternalist is one who holds in the past eternal existence of matter or of the world: to eternalise and eternise (derived from the adjective) to make eternal, to perpetuate, immortalise: eterne (probably from the Fr. *eterne*) is an obsolete synonyme of eternal.

The *eternal* God is thy refuge.
*Deuteronomy* xxxiii. 27.

And well beseems all knights of noble name,
That covet in the immortal book of fame
To be *eternized,* that same to haunt.
*Faerie Queene.*

The earth shall sooner leave her kindly skill
To bring forth fruit, and make *eternal* derth,
Then I leave you my liefe, yborn of hevenly birth.
*Id.*

Full hard it is, ' quoth he,' to read aright
The course of heavenly cause, or understand
The secret meaning of the *eternall* might,
That rules men's waies, and rules the thoughts of living wight.
*Id.*

That law whereby the *Eternal* himself doth work.
*Hooker.*

They which want furtherance unto knowledge, are not left in so great destitution, that justly any man should think the ordinary means of *eternal* life taken from them. *Id.*

The particular drift of every act, proceeding *eternally* from God, we are not able to discern; and therefore cannot always give the proper and certain reason of his works. *Id.*

Thou knowest that Banquo and his Fleance lives
—But in them nature's copy 's not *eternal.*
*Shakspeare.*

The Cyclops hammers fall
On Mars his armour, forged for proof *eterne.* *Id.*

You'll tell me his name shall live, and that now, being dead, his works have *eternized* him, and made him divine; but could his divinity feed *him* while he lived? could his nature feast him? *Ben Jonson.*

In this ground his precious root
Still lives, which when weak times shall be poured out
Into *eternity,* and circular joys
Dancing an endless round, again shall rise.
*Crashaw.*

Who would inglorious live, inglorious die.
And might *eternise* his name's memorie?
*Bp. Hall's Satires.*

For, God would, from *eternity* and before all worlds, create all men in the world, in that certain order, wherein he preconceived and predestinated to create them. *Id.*

Thy immortal rhyme
Makes this one short point of time,
To fill up half the orb of round *eternity.*
*Cowley.*

I might relate of thousands, and their names
*Eternise* here on earth; but those elect
Angels, contented with their fame in heaven,
Seek not the praise of men.
*Milton's Paradise Lost.*

I with two fair gifts
Created him endowed; with happiness,
And immortality: that fondly lost,
This other served but to *eternise* woe. *Milton.*

Beyond is all abyss,
*Eternity,* whose end no eye can reach! *Id.*

The *Eternal,* to prevent such horrid fray,
Hung out of heaven his golden scales. *Id.*

Man, that is even upon the intrinsick constitution of his nature, dissolvible, must, by being in an *eternal* duration, continue immortal.
*Hale's Origin of Mankind.*

Mankind by all means seeking to *eternize* himself, so much the more as he is near his end, doth it by speeches and writings. *Sidney.*

Hobbes believed the *eternal* truths which he opposed. *Dryden.*

Both of them are set on fire by the great actions of heroes, and both endeavour to *eternise* them.
*Id. Dufresnoy.*

The four great monarchies have been celebrated by the writings of many famous men, who have *eternized* their fame, and thereby their own. *Temple.*

It is a question quite different from our having an idea of *eternity,* to know whether there were any real being, whose duration has been *eternal?* *Locke.*

By repeating the idea of any length of duration which we have in our minds, with all the endless addition of number, we come by the idea of *eternity.*
*Id.*

That which is morally good, or evil, at any time, or in any case, must be also *eternally* and unchangeably so, with relation to that time and to that case.
*South.*

Bear me, some god, to Baja's gentle seats,
Or cover me in Umbria's green retreats,
Where western gales *eternally* reside,
And all the seasons lavish all their pride.
*Addison.*

*Eternity,* thou pleasing, dreadful thought!
Through what variety of untried being,
Through what new scenes and changes must we pass!
*Id.*

Hence came its name, in that the grateful Jove
Hath *eternized* the glory of his love.
*Creech's Manil.*

To sounds of heavenly harps she dies away,
And melts in visions of *eternal* day. *Pope.*

——— Blush at terror for a death
Which gives thee to repose in festive bowers,
Where nectars sparkle, angels minister,
And more than angels share, and raise, and crown,
And *eternise,* the birth, bloom, bursts of bliss.
*Young.*

Matter being supposed *eternal,* there never was a time when it could be diffused before its conglobation, or conglobated before its diffusion. *Johnson.*

My heart was completely tinder, and was *eternally* lighted up by some goddess or other; and as in every other warfare in this world my fortune was various, sometimes I was received with favour, and sometimes I was mortified with a repulse. *Burns.*

Can glittering plume, or can the imperial wreath
Redeem from unrelenting fate the brave?
What note of triumph can her clarion breathe,
T' alarm the *eternal* midnight of the grave?
*Beattie.*

Lo where it comes like an *eternity*,
As if to sweep down all things in its tract,
Charming the eye with dread. *Byron.*

ETESIÆ or Etesian Winds, are such as blow at stated times of the year, from what part soever of the compass they come. They are so called from the Greek word ετος, year, being anniversary winds, such as our seamen, call monsoons and trade winds, which in some parts of the world continue constantly blowing for certain stated seasons of the year. Thus, the north winds, which, during the dog-days, constantly blow upon the coasts of Egypt, and hinder all ships from sailing out of Alexandria for that season, are called etesiæ in Cæsar's Commentaries. See Egypt. In other authors, the west and east winds are called etesiæ, when they continue blowing for certain seasons of the year. Cellarius endeavours to prove that those winds are properly etesian, which blow from that part of the horizon which is between the north and west about the times of the solstice. In ancient writers they are represented as very mild and gentle; and were called by mariners somniculosi and delicati, from their sleeping, or ceasing to blow in the night.

ETFU, or Edfou, in geography, a village of Upper Egypt, situated near the Nile, above Esneh, built on the ruins of the great city of Apollo, or Apollinopolis Magna. It possesses an ancient temple, covered with hieroglyphics. 'The extent, majesty, and preservation of this edifice, says Denon,' who has given a view of it, 'surpassed all that I had seen in Egypt, or elsewhere; it made an impression on me as vast as its own gigantic dimensions. This building is a long suite of pyramidal gates, of courts decorated with galleries, of porticoes, and of covered naves, constructed, not with common stones, but entire rocks.' 'The excellent preservation of this ancient edifice forms a wonderful contrast with the gray ruins of modern habitations built within its vast enclosure; a part of the population of this village is contained in huts built in the courts, and around the fragments of the temple; which, like swallows' nests in our houses, defile them without concealing or injuring their general appearance.' Below Etfu, the country becomes narrow, so that there is only a quarter of a league in breadth between the desert and the river.

ETHER, *n. s.* } Fr. *ether*; Lat. *æther*; Gr.
Ethe'real, *adj.* } αιθηρ, from αιθω, to burn.
Ethe'reous, *adj.* } An element of greater supposed subtilty than the air; the element of the heavenly regions: the adjectives both mean formed of ether, celestial or heavenly.

They rove abroad in *ether* blue,
To dip the sithe in fragrant dew;
The sheaf to bind, the beech to fell,
That, nodding, shades a craggy dell.
*Warton.*

Go, heavenly guest, *ethereal* messenger,
Sent from whose sovereign goodness I adore.
*Milton.*

Behold the bright surface
Of this *ethereous* mould, whereon we stand. *Id.*
Thrones and imperial powers, offspring of Heaven,
*Ethereal* virtues! *Id. Paradise Lost.*

Such as these, being in good part freed from the entanglements of sense and body, are employed, like the spirits above, in contemplating the Divine Wisdom in the works of nature; a kind of anticipation of the *ethereal* happiness and employment.
*Glanville.*

There fields of light and liquid *ether* flow,
Purged from the ponderous dregs of earth below.
*Dryden.*

The parts of other bodies are held together by the eternal pressure of the *ether*, and can have no other conceivable cause of their cohesion and union.
*Locke.*

If any one should suppose that *ether*, like our air, may contain particles which endeavoured to recede from one another; for I do not know what this *ether* is; and that its particles are exceedingly smaller than those of air, or even than those of light, the exceeding smallness of its particles may contribute to the greatness of the force by which those particles may recede from one another. *Newton.*

Vast chain of being, which from God began,
Natures *ethereal*, human; angel, man. *Pope.*

—'Let there be light!' proclaimed the Almighty
Lord,
Astonished Chaos heard the potent word;
Through all his realms the kindling *ether* runs,
And the mass starts into a million suns. *Darwin.*

The Giant Form on Nature's centre stands,
And waves in *ether* his unnumbered hands;
Whirls the bright planets in their silver spheres,
And the vast sun round other systems steers. *Id.*

High over the fields of boundless *ether* roves,
And seeks amid the clouds her soaring loves. *Id.*

Love wreaths the flowery ways with fatal snare,
And nurse the *ethereal* fire that warms thy heart,
That fire *ethereal* lives but by thy care. *Beattie.*

Along the plain
The joyous swain,
Eyes the gay villages again,
And gold-illumined spire;
While on the billowy *ether* borne
Floats the loose lay's jovial measure. *Id.*

The trumpet breathed a note: and all in air.
The glories vanished from the dazzled eye;
And three *ethereal* forms, divinely fair,
Down the steep glade were seen advancing nigh.
*Id.*

Ether, or Æther, in chemistry, a compound of an acid and alcohol, of which there are several different kinds, such as nitric, sulphuric, muriatic ethers; which the reader will find described at length under the article Chemistry. Its medical uses will be treated of in the article Pharmacy.

ETHERIA, an ancient name of Ethiopia.

ETHERIDGE (Sir George), a celebrated wit and comic writer, in the reign of Charles II. and James II. descended from an ancient family in Oxfordshire, and born in 1636. He travelled in his youth; and, disliking the study of the law, devoted himself to the drama. His first dramatic performance, the Comical Revenge, or Love in a Tub, appeared in 1664: and introduced him to the leading wits of the time: in 1668 he produced a comedy called She would if she could; and, in 1676, he published his last comedy, called the Man of Mode, or Sir Fopling

Flutter. This piece is dedicated to the beautiful duchess of York, in whose service he then was; and who had so high a regard for him, that when, on the accession of James II., she came to be queen, she procured him the situation of ambassador, first to Hamburgh, and afterwards to Ratisbon, where he continued till the revolution. Being addicted to extravagance, he had greatly impaired his fortune; to repair which, he paid his addresses to a rich widow; but she refused to marry any man who could not bestow a title upon her; on which account he was obliged to purchase a knighthood. No author has fixed the period of his death, but some place it soon after the Revolution. Some say, he followed king James into France, and died there; but the authors of the Biographia Britannica mention a report, that after having entertained some company at his house at Ratisbon, where he had taken his glass too freely, and being too forward in waiting on his guests at their departure, flushed as he was, he tumbled down stairs and broke his neck. As to Sir George's literary character, he seems to have been endued with a genius whose vivacity needed no cultivation: for we have no proofs of his having been a scholar. His works, however, have been justly censured on account of their licentiousness.

ETH'IC, *adj.* } Gr. ηθικος, moral, from
ETH'ICAL, *adj.* } ηθος, originally a house
ETH'ICS, *n. s.* } thence the manners of per-
ETH'ICALLY, *adv.* } sons in houses. Relating to morals, or moral philosophy: the plural ethics is more commonly used to express a moral system, or the doctrine of morals.

For of all moral virtues, she was all
That *ethicks* speak of virtues cardinal. *Donne.*

I will never set politicks against *ethicks*; for true *ethicks* are but as a handmaid to divinity and religion. *Bacon.*

Persius professes the stoick philosophy; the most generous amongst all the sects who have given rules of *ethicks*. *Dryden.*

If the atheists would live up to the *ethicks* of Epicurus himself, they would make few or no proselytes from the Christian religion. *Bentley.*

My subject leads me not to discourse *ethically*, but Christianly, of the faults of the tongue.
*Government of the Tongue.*

ETHIOP, *n. s.* } From ETHIOPIA:
ETHIOPIAN, *adj.* & *n. s.* } see below. A native of Ethiopia; pertaining to that country; dark, black in complexion: and hence dark in character, of ill repute.

Can the *Ethiopian* change his skin, or the leopard his spots. *Jer.* xiii. 13.

Since her time are colliers counted bright,
And *Ethiops* of their sweet complexion crack.
*Shakspeare.*

Earn dirty bread by washing *Ethiops* fair.
*Young.*

# ETHIOPIA.

ETHIOPIA, a celebrated empire of Africa, whose boundaries have never been exactly defined either by ancient or modern geographers. It is generally divided into Upper and Lower: the former taking in modern times the name of ABYSSINIA, which see.

Some writers of antiquity gave the title of Ethiopians to all nations whose complexion was black: hence we find the Arabians as well as many other Asiatics sometimes falling under this denomination; besides a number of Africans whose country lay at a distance from Ethiopia Proper. Thus the Africans in general were by these writers divided into the western or Hesperian Ethiopians, and those above Egypt situated to the east of the former; the latter being much more generally known than the former, by the commerce they carried on with the Egyptians. From this account we may easily understand, why such an apparent disagreement exists among ancient authors concerning the situation of Ethiopia, as likewise why it should pass under such a variety of names. Sometimes it was named India, and the inhabitants Indians; an appellation likewise applied to many other distant nations. Sometimes it was denominated Atlantia and Etheria, and in the most remote periods of antiquity Cephenia; but more usually Abasene, a word resembling its modern names, Habash, Abassia, or Abyssinia. On the other hand, we find Persia, Chaldæa, Assyria, &c., styled Ethiopia by some writers; and all the countries extending along the coast of the Red Sea were promiscuously denominated India and Ethiopia. By the Jews the empire of Ethiopia was styled Cush and Ludim. Notwithstanding this diversity of appellations, and vast diffusion of territory ascribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the rest; and which was therefore called Ethiopia Propria. This was bounded on the north by Egypt, extending all the way to the lesser cataract of the Nile, and the island named Elephantine; on the west it had Libya interior; on the east the Red Sea, and on the south unknown parts of Africa; though these boundaries cannot be fixed with any precision.

A great variety of different nations are of course found in the ancient descriptions of this empire; to whom they gave names either from some personal property, or from their manner of living. The principal of these were, 1. The Blemmyes, seated near the borders of Egypt; and who, probably from the shortness of their necks, were said to have no heads, but eyes, mouths, &c. in their breasts. Their form, somehow or other, must have been very extraordinary, as we learn from Vopiscus, who gives an account of some of the captives of this nation brought to Rome. 2. The Nobatæ, inhabiting the banks of the Nile near the island Elephantine, said to

have been removed thither by Oasis to repress the incursions of the Blemmyes. 3. The Troglodytes, by some writers said to belong to Egypt, and described as little superior to brutes. 4. The Nubians. See NUBIA. 5. The Pigmies, by some supposed to be a tribe of Troglodytes; but by the most approved writers placed on the African coast of the Red Sea. 6. The Aualitæ or Abalitæ, of whom we know nothing more than that they were situated near the Abalitic Gulf. 7. The Struthiophagi, so called from their feeding upon ostriches, were situated to the south of the Memnones. 8. The Acridophagi. 9. Chelonophagi. 10. Ichthyophagi. 11. Cynamolgi. 12. Elephantophagi. 13. Rhizophagi. 14. Spermatophagi. 15. Hylophagi, and 16. Ophiophagi; all of whom had their names from their common food, viz. locusts, tortoises, fish, bitches' milk, elephants, roots, fruits or seeds, shrubs, and serpents. 17. The Hylogones, near to the Elephantophagi, and who were so savage that they had no houses, nor any other places to sleep in, but the tops of trees. 18. The Pamphagi, who used almost every thing indiscriminately for food. 19. The Agriophagi, who lived on the flesh of wild beasts. 20. The Anthropophagi, or man-eaters, now supposed to have been the Caffres, and not any inhabitants of Proper Ethiopia. 21. The Hippophagi, or horse-eaters, who lay to the north of Libya Incognita. 22. The Macrobii, a powerful nation, remarkable for their longevity; many of them attaining the age of 120 years. 23. The Sambri, situated near the city of Tenupsis in Nubia upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were destitute of ears. 24. The Asachæ, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Besides these, there were a number of other nations or tribes, of whom we scarcely know any thing but the name, as the Gapachi, Ptoemphanes, Catadupi, Pechini, Catadræ, &c.

The most famous cities and towns of ancient Ethiopia, were Abalis, Axum, Caloe, Melis, Mondus, Mosylon, Napata, Opone, and Premis or Premnis.

Of a country inhabited by such a variety of nations as we have above enumerated, all in a state of extreme barbarism, it is rather to be wondered that we have any history at all, than that it is not more distinct. It is generally agreed that Cush was the great progenitor of the inhabitants, and hence the country has sometimes been named from him. Many authors are of opinion, that Ethiopia received its first inhabitants from the country lying east of the Red Sea; and that the descendants of Cush, having settled in Arabia, gradually migrated to the south-east extremity of that country; whence, by an easy passage across the straits of Babelmandel, they transported themselves to the African side, and entered the country properly called Ethiopia: a migration which, according to Eusebius, took place during the residence of the Israelites in Egypt: but, in the opinion of Syncellus, after they had taken possession of Canaan, and were governed by judges. Mr. Bruce mentions a tradition among the Abyssinians, which, they say, has existed among them from time immemorial, that very soon after the flood, Cush, the grandson of Noah, with his family, passed through Atbara, then without inhabitants, till they came to the ridge of mountains, which separates that country from the high lands of Abyssinia. Here, still terrified with the thoughts of the deluge, and apprehensive of a return of the same calamity, they chose to dwell in caves made in the sides of these mountains rather than trust themselves in the plains of Atbara; and our author is of opinion, that the tropical rains which they could not fail to meet with in their journey southward, and which would appear like the return of the deluge, might induce them to take up their habitations in these high places. Be this as it may, he considers it as a fact, 'that here the Cushites, with unparalleled industry, and with instruments utterly unknown to us, formed to themselves commodious, yet wonderful, habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promise to do so till the consummation of all things.' The Cushites, having once established themselves among these mountains, continued to form similar habitations in all the neighbouring ones; and, thus following the different chains, spread the arts and sciences, which they cultivated, quite across the African continent from the eastern to the western ocean. According to the tradition above mentioned, they built the city of Axum, early in the days of Abraham. This city was anciently noted for its superb structures, of which there are still some remains. Among these is a magnificent temple, originally 110 feet in length, with two wings on each side, a double porch, and an ascent of twelve steps. Behind this stand several obelisks of different sizes. Mr. Bruce mentions some 'prodigious fragments of colossal statues of the dog-star,' still to be seen at this place; 'and Seir,' adds he, 'which, in the language of the Troglodytes, and in that of the low country of Meroe, exactly corresponding to it, signifies a dog, instructs us in the reason why this province was called Sirè, and the large river which bounds it Siris.' Soon after bounding the city of Axum, the Cushites founded that of Meroe, the capital of a large island in the Nile, where, according to Herodotus, they pursued the study of astronomy, in very early ages with great success. See MEROE. Mr. Bruce gives two reasons for their building this city in the low country, after having built Axum in the mountainous part of Abyssinia. 1. They had discovered some inconveniences in their caves both in Sire and the country below it, arising from the tropical rains in which they were now involved, and which prevented them from making the celestial observations to which they were so much addicted. 2. It is probable that they built this city farther from the mountains than they could have wished, in order to avoid the venomous fly, called tsaltsalya, and zimb, with which the southern parts were infested. Meroe, which lay in latitude 16° north, the exact limit of the tropical rains, was without the bounds assigned by nature to these destructive insects; and consequently a place of refuge for the cattle. Mr.

Bruce, on his return through the desert, saw at Gerri, in this latitude, ruins, supposed to be those of Meroe, and caves in the mountains immediately above them; for he is of opinion, that they did not abandon their caverns immediately after they began to build cities. As a proof of this, he mentions that Thebes, in Upper Egypt, was built by a colony of Ethiopians: and that near the ruins of that city, a vast number of caves are to be seen even up to the top of a mountain in the neighbourhood; all of which are inhabited at this day. By degrees, however, they began to exchange these subterraneous habitations for the cities they built above ground; and thus became farmers, artificers, &c., though originally their sole employment had been commerce.

Besides the territories already mentioned, the Cushites had extended themselves along the mountains which run parallel to the Red Sea on the African side; which country, according to Mr. Bruce, has 'in all times been called Saba, or Azaba, both of which signify south;' an epithet given it from its lying south of the Arabian Gulf, and which in ancient times was one of the richest and most important countries in the world. 'By that acquisition,' says Mr. Bruce, 'they enjoyed all the perfumes and aromatics in the east; myrrh, and frankincense, and cassia; all which grow spontaneously in that strip of ground from the Bay of Bilur west of Azab to Cape-Gardefan, and the southward up in the Indian Ocean, to near the coast of Melinda, where there is cinnamon, but of an inferior kind.' As the Cushites advanced still farther south they met not only with mountains, in which they might excavate proper habitations, but likewise with great quantities of gold and silver furnished by the mines of Sofala, which, our author says, furnished 'large quantities of both metals in their pure and unmixed state, lying in globules without alloy or any necessity of preparation or separation.' In other parts of this work he endeavours to prove Sofala to have been the Ophir of Scripture. See Ophir.

Thus the Ethiopians, for some time after their settlement, according to Mr. Bruce, must have been a nation of the first importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting the science of astronomy, for which they had an excellent opportunity by the clearness of the sky in the Thebaid. Their brethren farther south, or those who inhabited Ethiopia, properly so called, were confined for six months to their caves by the tropical rains, whence they were naturally led to pursuits of another kind. 'Letters,' says Mr. Bruce, 'at least one kind of them, and arithmetical characters, were invented by this middle part of the Cushites; while trade and astronomy, the natural history of the winds and seasons, were what necessarily employed that part of the colony established at Sofala most to the southward.' Travels, vol. i. p. 383.

While the Cushites were thus employed at home in collecting gold, gathering and preparing spices, &c., these commodities were sent into other countries by another set of people named Shepherds, who acted as carriers to them, and who afterwards proved so formidable to the Egyptians. See Egypt. These differed in their appearance from the Ethiopians, having long hair, and the features of Europeans; and were of a very dark complexion, though not at all like the negroes. They lived in the plain country in huts or moveable habitations, attending their cattle, and wandering up and down as circumstances required. By acting as carriers to the Cushites, they became a great and powerful people, possessing vast numbers of cattle, as well as a very considerable extent of territory. They possessed a strip of land along the Indian Ocean; and another north of that along the Red Sea; but their principal habitation was the flat part of Africa, between the northern tropic and the mountains of Abyssinia, which country is now called Beja. This reaches from Masuah along the sea-coast to Suakem; then turns west, and continues in that direction, having the Nile on the south, the tropic of Cancer on the north, and the deserts of Selima and Libya on the west. The next district was Meroe, now called Atbara, lying between the rivers Nile and Astraboras. A third district, now called Derkin, is a small plain lying between the river Mareb on the east, and Atbara on the west. But the most warlike of all the shepherds were those who possessed the mountains of Habab, reaching from the neighbourhood of Masuah to Suakem, which district is still inhabited by them. 'These shepherds,' says Mr. Bruce, 'were distinguished by several different appellations, which may be supposed to denote different degrees of rank among them.' Those called simply shepherds, he supposes to have been the persons who attended the flocks. Those called Hycsos or Agsos, signifying armed shepherds, are supposed to have been the soldiers. A third class were named Agag, supposed to be the chiefs or nobles of these armed shepherds; whence the title of king of kings, Mr. Bruce thinks, is derived; and he supposes Agag, who was killed by Samuel, to have been an Arabian shepherd. The building of Carthage augmented the power of the shepherds to a considerable degree, by the vast quantity of carriage naturally belonging to a place of such extensive commerce, and which fell into the hands of the Lehabim, Lubim, or Libyan peasants. An immense multitude of camels, in the early ages, answered the purpose of navigation: and thus we find that commerce was carried on by the Ishmaelites, as early as the days of Joseph, from the south extremity of the Arabian peninsula These shepherds, however, though generally the friends and allies of the Egyptians, who were also Cushites, sometimes proved very bitter enemies to them. The reason of this may be deduced from the great opposition betwixt their manners and customs. The Egyptians worshipped black cattle, which the shepherds killed and used as food; the latter worshipped the heavenly bodies, while the Egyptians worshipped idols of all kinds. Hence a mere difference in religion might occasion many bloody quarrels; though, if the above account can be depended upon as authentic, it is natural to imagine that the mutual connexion of interest should have cemented their friendship, in spite of dif-

ference in opinions. Besides the Cushites and Shepherds, Mr. Bruce allows that there are various nations inhabiting this country, who are fairer than either, and which, though they have each a particular name, are all known by the general title of Habesh; which may be translated by the Latin word *convenæ*, signifying a number of distinct people meeting accidentally in one place; and which our author maintains against Scaliger, Ludolf, &c. to be a very just translation, quite consonant to the history of Ethiopia. Mr. Bruce proceeds to prove that the ancient Ethiopians were not only the most learned people in the world, but that they spoke the original language, and were the inventors of writing. In what manner they came to degenerate into their present state of barbarity, cannot be known; this being a phenomenon equally unaccountable with the degeneracy of the Egyptians.

The most authentic ancient history of this country, according to Mr. Bruce, is the Chronicle of Axum: the character of which, among the modern Abyssinians, stands next to the sacred writings; and consequently must be esteemed the highest Abyssinian authority we have. According to this book, there was an interval of 5500 years between the creation of the world and the birth of Christ; 1808 years before which last event the empire of Abyssinia or Ethiopia received its first inhabitants. Two hundred years after its settlement, it was so destroyed by a flood, that it received the name of Ouré Midra, or a country laid waste; or, says our author, as it is called in Scripture itself, 'a land which the waters or floods had spoiled.' Isaiah xviii. 2. The peopling of the country was finished about A. A. C. 1400, by the settlement of a great number of people, speaking different languages, who sat down peaceably in the high lands of Tigré, in the neighbourhood of the shepherds, with whom they were in friendship. These people, according to tradition, came from Palestine; and our author is inclined to believe the whole of the relation to be true, as the time coincides with the expulsion of the Canaanitish nations by Joshua, which happened about A. A. C. 1490; ten years before which there had been, according to Pausanias, a flood in Ethiopia, which occasioned prodigious devastation. Ethiopia, he thinks, would afford the most ready asylum for the fugitive Canaanites, as they must have long had a commercial intercourse with that country; and he supports the opinion likewise from what Procopius mentions, of two pillars extant in his time, on the coast of Mauritania, with the following inscription in the Phœnician language, 'We are Canaanites, flying from the face of Joshua, the son of Nun, the robber.' The authenticity of these inscriptions, however, is much disputed, and therefore cannot establish any historical point. The first and most considerable of the colonies above mentioned settled in the province of Amhara; the second in Damot, one of the southern provinces; the third in a province called Lasta, or Tcheratz-Agow, from Tchera, their principal habitation; and a fourth in the territory of Gafat.

According to some ancient authors, the Ethiopians were conquered by Moses; who besieged their capital Meroe, a city almost impregnable, being surrounded with three rivers, the Nile, Astapus, and Astaboras. The daughter of the Ethiopian monarch, however, having an opportunity of seeing Moses from the walls, offered to deliver up the city, it is said, provided he would swear to marry her. With this requisition the Egyptian general complied; but treated the inhabitants with great severity; plundering the city, and putting many of the people to death. After this he ravaged the whole country, dismantling all the places of strength; and, having thus rendered the Ethiopians incapable of attempting any kind of offensive operations against other nations for a considerable time, he returned in triumph to Egypt, after an absence of ten years. We hardly account the foregoing as history; but from this time to that of Solomon there is an entire chasm in the Ethiopic annals. After this, however, we are furnished with some kind of regular accounts. They commence with the reign of the queen of Sheba, called Makeda by the Abyssinian historians, and who went to visit the Jewish monarch Solomon, and whom the Abyssinians suppose to have been sovereign of Ethiopia Proper; but Mr. Bruce is of opinion that she was only sovereign of the territory on the east coast of Africa named Saba. In favor of this opinion he urges, that it was customary for the Sabeans, who inhabited Saba, to be governed by women; whereas those who inhabited the opposite side of the Arabian Gulf, and who were named Sabean Arabs, or Homerites, were not only governed by kings, but would not allow their sovereigns to go abroad any where, under pain of being stoned to death. The Abyssinians, however, claim her for their sovereign; and their historians speak of her being struck with admiration at the sight of Solomon's grandeur, and the wisdom he displayed, as well as of her becoming a convert to the Jewish religion. Another part of her history, in the annals of this country, is, that she returned in a state of pregnancy, and within a year was delivered of a son, named David by Solomon, but by his mother Menilek, Menelech, or Menelcheck; that is, another self. When he grew up, he was sent to be educated, we are told, at the court of Solomon; where having staid some time, he was accompanied home by several doctors of the law, and particularly by Azariah the son of Zadoc the high priest. By these the Jewish religion was established in Abyssinia, where it continued till the introduction of Christianity. Azarias, who brought with him a Hebrew transcript of the law, it is added, was now constituted high priest; and though this book is lost, having been burnt along with the church at Axum, the office is still continued in the line of Azarias, whose successors are styled Nebrits, high priests, or keepers of the church, in that city. Makeda continued to enjoy the sovereignty for forty years; and the last act of her reign settled the succession to the throne. By this act the crown was declared hereditary in the family of Solomon for ever; it was also determined, that after her no woman should be entitled to wear it, or act as sovereign of the country; but that the sovereignty should descend to the most distant heirs male, rather than to the females, however near. Lastly, that the male

heirs of the royal family should always be sent prisoners to a high mountain, where they were to be confined till they should be called to the throne, or as long as they lived. This custom, according to Mr. Bruce, was peculiar to Abyssinia; the neighbouring shepherds being accustomed to have women for their sovereigns, which prevailed in the last century. Makeda, having established these laws, died in A. A. C. 986.

The transactions of Menilek after his accession are not recorded, farther than that he removed his capital to Tigré. In his time the empire was invaded by Shishak, king of Egypt, who plundered a rich temple at Saba, the capital of Ethiopia, and which probably occasioned the removal of the imperial seat to Tigré. It is indeed plain from Scripture, that Ethiopia, or great part of it, was subject to this monarch; as the Ethiopians, mentioned in his army which invaded Judæa, and plundered the temple of Jerusalem (2 Chron. xii. 3), are joined with the Lubims, or Libyans, and must therefore be regarded as inhabitants of Ethiopia Proper. This confirms the opinion of Sir Isaac Newton, who agrees with Josephus in supposing Shishak to have been the celebrated Sesostris of profane historians. Thus far we are certain, that in the passage of Scripture alluded to, the sacred historian indirectly ascribes the sovereignty of Ethiopia to Shishak; and we do not find it any where hinted, that another Egyptian monarch was possessed of this sovereignty. Herodotus also plainly tells us, that Sesostris was master of Ethiopia, and that no other Egyptian but himself ever possessed that empire. After the death of Shishak, Sir Isaac Newton is of opinion, that the Ethiopians defended Egypt against the Libyans, who had invaded that country during the civil war, which took place on the death of that great conqueror. In about ten years afterwards, however, they became the aggressors; drowned the successor of Shishak in the Nile, and seized on the whole kingdom; at which time Libya fell also into their hands. In the time of Asa, king of Judah, we find the combined host of the Ethiopians and Lubims attacking the territories of Judea, to the number of more than a million. 2 Chron. xiv. 9; xvi. 8. This confirms the above account; as it is not easy to conceive how the two nations should have combined in such a manner, unless Zerah had been master of both. The total overthrow which the allied army received from Asa, gave the inhabitants of Lower Egypt an opportunity of revolting; who, being sustained by an army of 20,000 auxiliaries from Phœnicia and Palestine, obliged Memnon to retire to Memphis. Soon after this, he was forced to leave Egypt altogether, and to retire into Ethiopia; but in about thirteen years he returned with his son Ramesses at the head of a powerful army, and obliged the Canaanitish forces to retire out of the Lower Egypt—a transaction denominated, by the Egyptian writers, the second expulsion of the shepherds. Sir Isaac Newton is of opinion, that the Egyptian princes Menes, Memnon, and Amenophis, were the same person; and that by him Memphis was either originally built or first fortified, to prevent the Egyptians from entering Ethiopia. He is also supposed to have been the son of Zerah, and to have died in an advanced age about ninety years after the death of Solomon. Thus, according to Sir Isaac Newton's chronology, the most remarkable transactions of antiquity will be brought lower by several ages, than by the usually received computations. According to this, the Argonautic expedition happened in the time of Amenophis; and some Greek writers inform us, that he assisted Priam king of Troy with a body of forces. He was succeeded by Ramesses, who built the northern portico of the temple of Vulcan at Memphis. The next was Moeris; who adorned Memphis, and made it the capital of his empire, about two generations after the Trojan war. Cheops, Cephrenus, and Mycerinus successively followed Moeris; the last being succeeded by his sister Nitocris. See Egypt.

In the reign of Asychis, the successor of Nitocris, both Ethiopia and Assyria revolted from Egypt; which, being now divided into several small kingdoms, was quickly subdued by Sabacon or So, the emperor of Ethiopia. This monarch, soon after his accession to the throne of Egyyt, allied himself with Hoshea, king of Israel; by which means the latter was induced to revolt from the Assyrians; and in consequence of this an end was put to the kingdom of Israel by Shalmaneser, king of Assyria, in the 24th year of the era of Nabonassar, A.A.C. 720. According to Herodotus, this monarch voluntarily resigned the crown of Egypt after he had enjoyed it fifty years; but Africanus relates, that after a reign of eight years, he died in Egypt, in the ninth year of Hezekiah, king of Judah. His successor, Sethon, supposed to be the Sevechus of Manetho, advanced to Pelusium with a powerful army against Sennacherib king of Assyria; when the bow-strings of the Assyrians were gnawed in pieces by a great number of rats or mice, and thus they were easily defeated with great slaughter by the Egyptians. Hence Herodotus informs us, that the statue of Sethon which he saw in Egypt had a mouse in its hand. Sir Isaac Newton, however, explains the whole in an allegorical manner. As the mouse among the Egyptians was a symbol of destruction, he conjectures, that the Assyrians were on this occasion overthrown with great slaughter; and that Sethon, in conjunction with Tirhakah, either king of the Arabian Cushites, or a relation of Sethon and his viceroy in Ethiopia Proper, surprised and defeated Sennacherib betwixt Libnah and Pelusium, making as great slaughter among his troops as if their shield straps and bow-strings had been destroyed by mice. In the 78th year of the era of Nabonassar, the empire of Ethiopia was subdued by Esarhaddon king of Assyria; who held it three years, committing enormous cruelties both in that country and in Egypt.

After the death of this tyrant the Ethiopians shook off the yoke, and maintained their independency till the time of Cyrus; who, according to Xenophon, seems to have also been sovereign of Ethiopia. After his death they revolted, and his son Cambyses unsuccesfully attempted to reduce them. Herodotus informs us, that before

he undertook this expedition, he sent some of the Ichthyophagi ambassadors to the king of the Macrobii, under pretence of soliciting his friendship, but in reality to discover the strength of the country. Of this the Ethiopian prince was aware, and told the ambassadors that he knew their design, reproached Cambyses with his injustice and ambition, and gave them his bow; telling them, at the same time, that the Persians might think of invading Ethiopia when they could easily bend it; and, in the mean time, that their master ought to thank the gods, who had never inspired the Ethiopians with a desire of extending their territories by conquest. Cambyses had sent by the ambassadors a rich purple robe, gold bracelets, a box of precious ointment, a vessel full of palm wine, and other things, which he imagined would be acceptable to the Ethiopian monarch. But all these, excepting the wine, were despised. This, he owned, was superior to any liquor produced in Ethiopia; and he intimated, that the Persians, short-lived as they were, owed most of their days to the use of this excellent liquor.—Being informed by the ambassadors, that a considerable part of the food used by the Persians was bread, he said that it was no wonder to find people who lived on dung unable to attain the longevity of the Macrobian Ethiopians. In short, the whole of his answer was so contemptuous and disgusting that Cambyses was filled with the greatest indignation; and instantly began his march without taking time to make the necessary preparations, or even to procure provisions for his army. Thus a terrible famine ensued among his troops, and the soldiers are said to have been reduced to eat one another: Cambyses himself, finding his life in danger, was at last obliged to retreat. Another army which he sent against Ammonia, to destroy the celebrated oracle of Jupiter Ammon, perished entirely in the deserts, being overwhelmed with the vast clouds of sand frequently raised there by the wind. At this time it is doubtful whether Cambyses would have accomplished his purpose, even if he had found it practicable to march into the heart of Ethiopia. This empire had but a short time before received a very considerable accession of strength by the desertion of 240,000 Egyptians who had been posted by Psammenitus in different places on the frontiers. These, not having been relieved for three years, had gone over at once to the emperor of Ethiopia, who placed them in a country disaffected to him; ordering them to expel the inhabitants, and take possession of their lands. Notwithstanding this, however, Sir Isaac Newton thinks that Cambyses conquered Ethiopia about the 223rd or 224th year of the era of Nabonassar; but this opinion does not appear to be well founded. We are told, indeed, that the Persian monarch, notwithstanding the misfortunes above mentioned, did really make himself master of some of the Ethiopic provinces which bordered on Egypt; and that these, together with the Troglodytes, sent him an annual present of two chænixes of unrefined gold, 200 bundles of ebony, five Ethiopian boys, and twenty elephants teeth of the largest size; but it appears very improbable, that Cambyses could have conquered the vast regions of Ethiopia Proper, Sennaar, and Abassia, which were all included in the Ethiopia of the ancients. When Xerxes invaded Greece, his army was partly composed of Ethiopians, of whom Herodotus mentions two distinct races of people. One of these inhabited the Asiatic coast, and differed from the Indians only in their hair and language. Their arms were the same with those of India; they wore helmets made of the skins of horses, the ears and manes of which served them for tufts and plumes of feathers; their shields being made of the skins of cranes. The hair of the Asiatic Ethiopians was long, but that of the western tribes was frizzled. The latter were also differently armed, having darts lighted at one end and covered with leather. We are not informed particularly whether these troops were subjects of the king of Persia or only auxiliaries; and therefore we can conclude nothing certain concerning the dominion of the Persian monarchs at this time over Ethiopia. They might possess some of the provinces next to Egypt, while the main body of the empire being in a state of independence, and unconnected with other parts of the world, has not been noticed by historians. Though Alexander had a desire to know the sources of the Nile, he did not suffer himself to be diverted by this curiosity from pursuing his grand expedition into Persia. Ptolemy Euergetes, however, appears to have carried this curiosity to such a length as to have invaded Ethiopia for no other purpose. It is surprising that the particulars of this expedition are not recorded by any historian, as it appears by an inscription that he actually penetrated to the farthest parts of the empire, and conquered the most powerful nations in it. Of this we have the following account, which the best historians consider authentic; copied on the spot (at the western entrance of Adule, a city of Ethiopia) by Cosmus Egyptius, or Indicopleustes, in the time of the emperor Justin I. 'Here, facing the road to Axuma, stood a chair of white marble, consisting of a square base, a small thin column at each angle of this base, with a larger wreathed one in the middle, a seat or throne upon these, a back and two sides. Behind this chair there was a large stone three cubits high, which had sustained considerable injury from time. This stone and chair contained an inscription to the following purpose: 'Ptolemy Euergetes penetrated to the farthest parts of Ethiopia. He subdued Gaza, Agame, Signe, Ava, Tiamo, or Tziamo, Gambela, Zingabene, Angabe, Tiama, Athagaos, Calaa, Semene, Lasine, Zaa, Gabala, Atalino, Bega, the Tangaitæ, Anine, Metine, Sesea, Rauso, Solate, the territory of Rauso, and several other kingdoms. Among the nations he reduced were some inhabiting mountains always covered with a deep snow; and others seated upon ridges of hills, whence issued boiling streams, and craggy precipices, which therefore seemed inaccessible. Having finally, after all these conquests, assembled his whole army at Adule, he sacrificed to Mars, Neptune, and Jupiter; for his great success, he dedicated this chair or throne to Mars.'

From the time of Ptolemy to that of Augustus, we meet with nothing of any consequence re-

lating to Ethiopia Proper. The Roman forces having about this time been drawn out of Egypt, in order to invade Arabia, Candace queen of Ethiopia, or rather of the island of Meroe, took the opportunity of their absence to make an irruption into the province of Thebais. As there was at that time no force to oppose her, she met for some time with great success; but hearing at last that Petronius, governor of Egypt, was in full march to attack her, she retired into her own dominions. Petronius pursued her as far as Pselcha, where with 10,000 men he gained an easy victory over 30,000 undisciplined Ethiopian savages, armed with poles, hatchets, and the like weapons. This victory was soon followed by the reduction of several fortresses; but, as the Roman soldiers were greatly incommoded by the heat, Petronius was obliged at last to retire. Soon after, Candace sent ambassadors to Augustus himself, with such magnificent presents, that the emperor was induced to grant her a peace on her own terms. From this time the Romans accounted themselves masters of Ethiopia: Augustus was complimented on the great glory he had acquired, by reducing a country till that time unknown even to the Romans, and thus completing the conquest of Africa. No material alteration, however, took place in the affairs of Meroe in consequence of this conquest, whether real or pretended. Pliny informs us, that it had been governed by queens, who bore the title of Candace, for several generations before that time; and so it continued to be afterwards, as we learn from Scripture, where we are informed that, in the reign of Tiberius, the sovereign of Ethiopia was named Candace. Some, indeed, are of opinion, that the Candace mentioned in Acts, viii. 27, was the same with her who had been conquered by Augustus.

From an anecdote of the debauched emperor Heliogabalus, who was accustomed to confine his favorites, by way of diversion, with old Ethiopian women, we may learn that some intercourse took place between the two empires, and that the Ethiopians owned some kind of subjection to the Romans. The Blemmyes, a gang of monstrous banditti, who inhabited the frontiers of Thebais, were vanquished by the emperor Probus: but, towards the close of the third century, they again became so powerful, that, in conjunction with the Nobatæ, they committed such depredations in the Roman territories, that Dioclesian was obliged to assign lands to the latter, and to pay both of them a considerable sum annually, to desist from their former practices. These expedients did not answer the purpose; the savages continued their depredations till the time of Justinian I., who treated them with severity, and oliged them to remain at peace. Procopius says, that before the time of Dioclesian, the Roman territories extended so far into Ethiopia, that their boundaries were not twenty-three days' journey from the capital, so that probably the whole empire had been in a state of dependence on them. From this period, to that of their conversion to Christianity, we find nothing remarkable in the history of the Ethiopians. This event happened about A. D. 327, soon after the establishment of Christianity at Rome by Constantine, when the gospel was preached in Ethiopia by Frumentius. He was a kinsman and companion of the philosopher Meropius, of Tyre: who, having travelled over all India, died on an island of the Red Sea. After his death, Frumentius, with Ædesius, who had also been his companion, were brought before the king of Ethiopia, to whom that island was subject. He took them into his service; making the one his treasurer and the other his butler. On the death of this prince, the queen refused to allow them to depart out of the kingdom; but committed the management of her affairs entirely to Frumentius, who is said to have diffused the Christian religion throughout the country; and became the first bishop of Axum. The two princes, Abra and Asba, or Abreha and Atzbeha, who reigned jointly in Ethiopia in the time of Frumentius, lived in such harmony together, that their friendship became proverbial. After being converted to Christianity, they adhered strictly to the orthodox doctrine, refusing to admit an Arian bishop into their country. In the time of the emperor Constantius, however, Arianism was introduced, and greatly favored; and an attempt was made to depose Frumentius on account of his refusal to embrace it.

The reign of Abra and Asba is remarkable for an expedition into Arabia Felix, called by the Mahommedan writers the war of the elephant, and which was undertaken on the following occasion:—The temple of Mecca, situated nearly in the middle of the Arabian peninsula, had been held in the greatest veneration for nearly 1400 years: probably from the notion entertained by the people in the neighbourhood, that Adam pitched his tent on that spot. Here also was a black stone supposed to possess extraordinary sanctity, as being that on which Jacob laid his head when he had the vision of angels. This temple, according to Mr. Bruce, was built by Sesostris, who was worshipped there under the name of Osiris. He supposes, that, on account of the veneration in which this tower and idol were held by the Arabians, the thought was first suggested of making it the emporium of the trade between India and Africa; but Abra, in order to divert it into another channel, built a very large temple near the Indian Ocean in the country of the Homerites; and, to encourage the resort of people to this new edifice, bestowed upon it all the privileges of the one at Mecca. The tribe of Arabians named Koreish, in whose country Mecca stood, being now, therefore, alarmed at the thoughts of having their temple deserted, entered the new one in the night, burned all that could be consumed, and besmeared the ruins with human excrement. Abra, provoked at this sacrilege, assembled a great army, with which he invested Mecca, himself appearing on a white elephant, whence the war took its name. The termination of the war, according to the Arabian historians, was miraculous. A vast number of birds, named abibil, came from the sea, having faces like lions; each carrying in his claws a small stone about the size of a pea, which they let fall upon the Ethiopian army in such numbers, that every one of them was destroyed. At this time it is said, that the small-pox first

made its appearance; and the more probable account of the destruction of the Ethiopian army is, that they perished by this distemper. The war of the elephant is supposed to have terminated about A. D. 360: from which time to that of Elesbaan, named also Caleb, we meet with nothing remarkable in the Ethiopic history; excepting that the court and principal people, if not the nation in general, relapsed into idolatry, which, it is said, prevailed till A. D. 521, when they were again converted by their king, Adad or Adag, whom some suppose to be the same with Elesbaan. Be that as it may, Elesbaan engaged in a war with the Homerites, or Sabæans, in Arabia Felix; whom he overthrew in battle, and put an end to their kingdom; after which he embraced the Christian religion in token of gratitude for the success he had met with. In the time of this prince a violent persecution of the Christians took place in Arabia. The Jewish religion had now spread itself far into that peninsula; and in many places the professors of it were become absolute masters of the country, insomuch that several Jewish principalities had been erected, the sovereigns of which commenced a severe persecution against the Christians. Among the rest, one Phineas distinguished himself by his cruelty, having prepared a great number of furnaces or pits filled with fire, into which he threw those who refused to renounce Christianity. The Christians applied for relief to the emperor Justin; but he, being at that time engaged in a war with the Persians, could not interfere: however, in 522, he sent an embassy to Elesbaan, who was now also a member of the Greek church, intreating him to exert himself for the relief of the Christians of Arabia. On this the emperor commanded his general Abreha, governor of Yemen, to march to the assistance of Aretas, son to a prince of the same name, whom Phineas had burnt: while he himself prepared to follow with a more considerable force. But, before the arrival of the Ethiopian monarch, young Aretas had marched against Phineas, and entirely defeated him. Soon after, the emperor himself arrived, and gave Phineas a second defeat: but, notwithstanding these misfortunes, it does not appear that either the principality of Phineas, or any of the other Jewish ones, was at this time overturned; though it seems certain that, at this time, the Ethiopians possessed part of the Arabian peninsula. According to the Arabian historians, the war of the elephant, with the miraculous destruction of the Ethiopian army, took place in the reign of Elesbaan. Some historians mention, that the Ethiopian monarchs embraced the doctrine of Mahomet soon after the impostor made his appearance; but this seems not to be well founded: though it is certain that the Najaski, or Ethiopian governor of Yemen, embraced Mahommedanism, and that he was related to the royal family. On this occasion, however, the Ethiopians lost all the footing they once had in Arabia; the governors being expelled by Mahomet and his successors. They fled to the African side of the Red Sea with numbers of their subjects, where they erected several small kingdoms, as Adel, Wypo, Hadea, Mára, and others. During the conquests of the caliphs, the Jews were for some time every where driven out of their dominions, or oppressed to such a degree that they voluntarily left them. Ethiopia offered them an asylum: and in this country they became so powerful, that a revolution in favor of Judaism seemed ready to take place. One family had always preserved an independent sovereignty on a mountain called Samen, the royal residence being on the top of a high rock; and several other high and rugged mountains were used as natural fortresses. Becoming by degrees more powerful, Judith the daughter of one of their kings, formed a design of overturning the Ethiopian government, and setting aside the family of Solomon, who had hitherto continued to enjoy the sovereignty. This design was facilitated by several circumstances. The empire had been weakened by an unsuccessful war, famine, and plague; the throne was possessed by an infant; and the absurd custom of confining the whole royal family on a rock, named Damo, gave her an opportunity of cutting them all off at once by surprising that place. Fortunately, however, the king escaped the general catastrophe, and was conveyed by some of the nobility of Amhara to the province of Xoa, or Shoa; by which means the line of Solomon is stated to have been preserved, and afterwards restored, though not till after a very considerable interval.

Judith, having by this massacre established her own power, assumed the imperial dignity, though in direct opposition to the established law, that no woman should enjoy the sovereign power. The people, however, seemed to have submitted quietly to her government, as she sat on the throne for forty years, and afterwards transmitted the sovereignty to five of her posterity, who reigned successively. We are not furnished with any particulars concerning their reigns; farther than that they were great oppressors. Another revolution took place, and a new set of usurpers, related to the family of Judith, but not their direct lineal descendants, succeeded to the throne. These were Christians, and governed with much greater lenity than the Jewish sovereigns had done; but still, being usurpers, none of their transactions are recorded in the Abyssinian annals, excepting those of Lalibala, who was accounted a saint. He lived in the end of the twelfth, or beginning of the thirteenth century, and proved a great prince. At that time the Christians in Egypt were grievously persecuted by the Saracens, who had a particular abhorrence of masons, builders, and stone-cutters; looking upon them as the chief promoters of idolatry, by the ornaments connected with their works. The refugees of this description were joyfully received by Lalibala; and were employed by him in hewing churches out of the solid rock, after the example of the ancient Troglodytic habitations: many works of this kind still remain in the country. He undertook, however, a still more arduous task; that of lessening the stream of the Nile, and thus starving the whole kingdom of Egypt, now in the hands of his enemies. From the account given by Mr. Bruce of this project, it appears that there was some possibility

of accomplishing it; not indeed by turning the course of the Nile itself, but by diverting that of many of those branches which convey into it the water of the tropical rains. He says, that Lalibala succeeded in his enterprise so far as to divert the course of two large tributaries of the Nile, and that they have ever since flowed into the Indian Ocean. He next proceeded to carry a level towards a lake named Zagvia, into which many rivers flow, whose streams contribute to increase that of the Nile; and, had this been accomplished, the loss of so much water would have been very sensibly felt by the Egyptians. This enterprising monarch was prevented by death from executing his design; though Mr. Bruce informs us of a written account at Xoa, in which it was asserted, that he was dissuaded from it by certain monks, who told him, that by sending down such a quantity of water to the eastern and dry parts of Africa, these countries would soon become so fertile and populous, that they would rival the empire of Ethiopia, or at least withdraw their allegiance from it. The remains of these works were seen by the Portuguese ambassador in 1522.

All this time the princes of the ancient line had been obliged to content themselves with the sovereignty of the province of Xoa, and made no attempt to regain their former dignity; but they were unexpectedly restored without bloodshed or disturbance, by Naacueto Laeb, the grandson of Lalibala. This prince, of a pacific disposition, was persuaded by a monk named Tecla Haimanout, greatly celebrated for his sanctity, to resign the crown, to which, though he received it from his father, he could not pretend to have any right. It was now agreed therefore that Naacueto should give up the empire to Icon Amlac, the lineal descendant of Solomon, who then possessed the sovereignty of Xoa; but that a portion of land should be irrevocably assigned to Naacueto and his heirs, over which he should be allowed to exercise an absolute sovereignty, as a testimony of this sacrifice. The monk, in this treaty, did not forget his own interest. He had founded a famous monastery in Xoa, and was primate of the whole empire under the title of Abuna. He now insisted that one-third of the kingdom of Ethiopia should be ceded to himself, for the maintenance of his own dignity, and the support of the clergy, convents, &c., throughout the country; and that no native Abyssinian should ever enjoy the same dignity with himself, even though he should have been chosen and ordained at Cairo, as was the custom with the Abyssinian prelates. These extraordinary terms were complied with, and Icon Amlac ascended the throne of Ethiopia.

This prince did not remove the seat of government from Tegulat, the capital of the province of Xoa; but continued there during the whole of his life, which lasted fifteen years after his accession. We are ignorant of the transactions of his reign, as well as that of several of his successors; five of whom ascended the throne in as many years: and we have no particular account of the transactions of the empire till the time of Amda Sion, who began to reign in 1312. He was the son of Weden Araad, the youngest brother of Icon Amlac, and succeeded to the throne on the death of his father. He professed the Christian religion; but his practice seems to have been very opposite to its precepts. He began his reign with living publicly with a concubine of his father's; and quickly after committed incest with his two sisters. On this he was first exhorted to repentance, and then excommunicated, by Honorius, a monk greatly celebrated for his sanctity, and who has since been canonised. The prince, enraged at this indignity, caused the saint to be severely whipped through every street of his capital. The same night the town was set on fire, and reduced to ashes; the clergy persuading the people, that the blood of Honorius had turned to fire as it dropped on the ground, and thus occasioned the catastrophe; but Amda Sion, suspecting that the monks themselves had been the incendiaries, banished or imprisoned them all, so that their hopes of exciting an insurrection were disappointed; and, being dispersed into those provinces where the inhabitants were mostly Jews or Pagans, they were now obliged to apply to their proper duty, viz. the diffusion of the gospel. While the emperor was busy with the monks, one of his commercial factors was assassinated by the Moors in the province of Isat; on which he assembled his troops, and fell upon the nearest of the Mahommedan settlements, massacring all he met without exception. He ultimately laid waste the whole country with fire and sword, carrying off an immense booty. For some time the Moors were so surprised that they did not think of making opposition; but at last they took up arms, and attempted to surprise the Abyssinian monarch in his camp. With this view they approached the camp in the night-time, expecting to have found the emperor and his soldiers immersed in sleep. Unexpectedly, however, he had been joined by a considerable part of his army, whom he drew up in battle array to receive his enemies. An engagement ensued, in which Amda Sion behaved with great valor; killed the Moorish general with his own hand, and gained a complete victory. He then commanded such of his soldiers as could not find houses ready built, to build huts for themselves, and a large tract of land to be ploughed and sown, as if he meant to stay in the country of the enemy during the rainy season. The Mahommedans now perceiving that they were in danger of being totally exterminated, willingly submitted to his terms; while the monarch conciliated the affections of his people by dividing among them the vast plunder he had acquired. But the Moors no sooner found themselves freed from immediate danger, than they prepared for a new revolt. They renewed hostilities by plundering some villages belonging to the Christians, and destroying their churches. A most formidable combination had taken place; but the superstition of Amano, king of Hadea, one of the chiefs of the revolt, was instrumental in giving the first blow to the rebellion. This man, by the advice of a necromancer, in whom he put great confidence, instead of marching his troops to the assistance of his allies, remained at home, where he was defeated and taken prisoner by a detachment of the imperial army. The governor of Amhara was next despatched against Saber-

eddin, the revolted governor of Fatigar, with orders to lay waste the country, and use every method to force him into an engagement, in which he was defeated; the victors plundering his house, and taking his wife and children prisoners. But in the mean time intelligence was received of a new revolt among the Falasha, who had assembled a formidable army. They were, however, entirely defeated by Tzaga Christos, another Abyssinian general, who soon after joined the emperor. Saber-eddin, no longer able to support himself against the united forces, was obliged to surrender at discretion, and all the rest were quickly reduced; so that Amda Sion was at leisure to march against the kings of Adel and Mara, who, having now united their forces, resolved to give him battle. At this the Abyssinian monarch was so exasperated, that he vowed to take ample vengeance; swore on the holy eucharist, in the presence of his whole army, that 'though but twenty of his army should join him, he would not turn his back upon Adel or Mara, till he had either forced them to tribute and submission, or entirely extirpated them and their religion.' The army not only applauded this with loud shouts, but protested that they looked upon themselves to be all bound by the oath he had taken: and, as he had mentioned in his speech that the plunder had been purchased by the lives of their Christian brethren, they determined to show their abhorrence at keeping any of it. Taking lighted torches therefore in their hands, they set fire to the plunder that had been amassed since the beginning of the war. Notwithstanding this enthusiasm, however, the expedition did not proceed successfully. This arose principally from the superstition of the Abyssinians, who were always averse to travelling, and especially to fighting, in the night. Their enemies, therefore, always chose this season for coming to an engagement; and so harassed the Abyssinian monarch, that his troops began to complain; and, on the commencement of the rainy season, insisted on being allowed to return. Amda Sion on this told them, that, if they were afraid of rains, he would conduct them to a country where there were none; meaning Adel, which, though within the limits of the tropical rains, has them at a different season to Abys[illegible] Thus he persuaded his army again to set forward; but was so grievously harassed by the nocturnal attacks of the Moors, that he was once more in danger of being deserted; and when by his eloquence he had dissipated the apprehensions of the soldiers, he was seized with a violent fever. To add to his disasters, while the troops were indulging themselves in inaction, they heard that the Moors, having assembled an army of 40,000 men, were in full march to attack them. The king now fainted on attempting to make himself ready for battle. Still, however, his courage was unabated. Having refreshed himself, he said to his soldiers: 'As it never was my opinion, that it was my own strength and valor, or their want of it, which has so often been the cause of preserving me from their hands, so I do not fear at present that my accidental weakness will give the enemy any advantage over me, as long as I trust in God's power as much as I have ever done.' The drooping spirits of the Abyssinians were, it is said, revived by this speech, and they only begged that their monarch would now trust to their valor, and not expose his own person. His advanced guard, however, was soon attacked and driven back on the main body by a detachment of the Moors, who had along with them a number of women provided with drugs to poison, and spells to enchant the waters. On this a dreadful panic seized the whole Abyssinian army; who, for the greater part, not only refused to advance, but resolved to leave the camp, and return homewards immediately. The king, sensible that all was lost if this pernicious scheme should be adopted, and perceiving that nothing was to be gained by reasoning with men so much terrified, only requested that such as would not fight, would stand quiet spectators of the battle. Even this had little effect: so that finding the enemy now ready to make an attack, he ordered his master of the horse, with only five others, to attack the left wing of the enemy; while he, with an almost equally small party, made an attack on the right. This desperate effort was attended with decided success. The king, notwithstanding his weakness, killed with his own hand two commanding officers of the enemy's right wing; while his son despatched another of considerable rank belonging to the left. The Moorish army on this began to lose courage; while the Abyssinians, ashamed of their conduct, rushed furiously on to rescue their prince from danger. The battle then raged for some time with great fury; but at last the centre and left wing of the Moors were defeated, and the right, composed principally of Arabians, retired in a body. Not knowing the country, they entered a deep valley entirely covered with wood and surrounded by perpendicular rocks. The Abyssinians imagining they had nothing more to do, began to strip and mangle the bodies of the killed and wounded; but Amda Sion, perceiving the situation of the Arabians, ordered a detachment to ascend the rocks, whence they rolled down immense stones; which threw them into such confusion, that, being neither able to fly nor resist, they were all killed to a man. The fate of the Moors was little better. The other division of the Abyssinian army found them lying round a pool of water, which they lapped like dogs, and fell upon them with fury. At last, wearied with slaughter, they took a few prisoners, among whom was Saleh king of Mara with his queen; the former of whom was hanged by order of Amda Sion, and the latter cut in pieces, and her body given to dogs. This signal victory was gained in the end of July 1316; but, as the rains at that season set in with violence, most of the army now again insisted on returning home. The emperor and principal officers, however, were of opinion, that the advantages so dearly purchased ought by all means to be pursued, till they had either reduced the Mahommedans to subjection, or at least deprived them of power to make future attacks on the empire. This opinion being adopted, Amda Sion sent home the baggage, women, and incumbrances of the army, retaining only the veteran soldiers. Advancing farther into the Mahommedan territory, he took up his residence in a large town

called Zeyla; from whence he, on the night of his arrival, sent out a detachment to surprise a village near it, named Taraca. Continuing to advance, he detached parties to lay waste the country round; and in this expedition cut off two of the principal authors of the conspiracy. He then proceeded to invade Talab and Abalge in the territories of the king of Adel, and, being well supported by his troops, defeated the latter in a pitched battle; the king himself, with almost all his men, being killed on the spot. In this desperate state of their affairs, three Adelian princes, sons of the late king, with their uncle, waited upon Amda Sion to intreat his pardon; but the only promise they could obtain was, that if the queen, with the rest of the royal family, would surrender themselves to the conqueror next day, he would cease to lay waste their territory. The nobles, however, resolved to venture another battle, and bound themselves by an oath, to support each other to the last. The conflict was long doubtful; and in opposition to Amda Sion appeared the young king of Wypo, who every where encouraged his troops, and made the most obstinate resistance. At last the Abyssinian monarch sheathed his sword, and taking a bow wounded the young prince mortally in the neck. On this the Adelians fled, but were so completely intercepted by two Abyssinian detachments, that only three men escaped. On the side of the Abyssinians, however, the victory was dearly purchased; many of the principal officers being killed, and scarcely a man of their cavalry escaping without a wound.

At last, weary of conquest and carnage, this victorious monarch, who never was defeated, returned in triumph to his capital, where he ended his days after a reign of thirty years. In his time we find that the rest of the royal family were not confined, according to the ancient practice; for Saif Araad, the son and successor of Amda Sion, distinguished himself in one of the battles in which his father was engaged. Though this prince was by no means destitute of military talents, the Abyssinian empire enjoyed a profound peace during his reign. The only remarkable transaction was the relief given by him to the Coptic patriarch, whom the sultan of Egypt had thrown into prison. At this time a great trade was carried on through the desert, by caravans between Cairo and Abyssinia, as well as from Cairo and Suakem on the Red Sea; but the Ethiopic monarch having seized the merchants from Cairo, and sent parties of horse to interrupt the caravans in their passage, the sultan was soon content to release the patriarch, whom he had imprisoned only with a view to extort money. In the reign of Theodorus, who held the crown of Ethiopia from 1409 to 1412, an infringement was made on the treaty above-mentioned, between Icon Amlac and the Abuna, Tecla Haimanout. By that treaty the Abuna was to have a full third of the whole empire for the support of his dignity and that of the church; but Theodorus, considering this as an unreasonable acquisition, reduced it very considerably, though he still allowed the priesthood an ample revenue out of every province of the empire. The annals of this prince's reign are very defective; Mr. Bruce supposes that they have been mutilated by the ecclesiastics. By his subjects, however, he was considered as such a saint, that in Mr. Bruce's time the people believed he was to rise again and to reign 1000 years in Abyssinia.

Zara Jacob, who began his reign in 1434, is the next prince of whom the Abyssinian annals narrate any affair of consequence. The character of this prince is represented as not inferior to that of Theodorus, or indeed of any monarch that ever sat on the throne of Ethiopia. He is in short set forth as another Solomon; though, from some parts of his conduct, this character seems to be rather exaggerated. The first remarkable transaction of his reign was his sending an embassy to the council of Florence. The ambassadors were priests from Jerusalem, who, in that assembly, adhered to the opinions of the Greek church; and the embassy itself was judged to be of such consequence, as to be the subject of a picture in the Vatican. This prince obtained also a convent at Rome from the pope for the use of the Abyssinians: which was preserved until the middle of the last century. He seems to have been very desirous of keeping up a correspondence with Europeans as well as the Asiatics; and in his time we first read of a dispute in Abyssinia with the Frangi or Franks, on the subject of religion. This was carried on in presence of the king between one Abba George, and a Venetian painter, Francisco de Branco Lione, in which the former confuted and even convinced his antagonist; but from this time we find a party formed for the church of Rome, which probably took its rise from the embassy to the council of Florence. Zara Jacob is disgraced, however, by being the first who introduced persecution for religion into Abyssinia; while, for this reason probably, he is so highly commended by the ecclesiastics. The state of Christianity in Ethiopia was now indeed very corrupt. The Greek profession had been originally established on the model of Alexandria; but in the low provinces bordering on the coast of Adel, the Mahommedan superstition prevailed. Many of that persuasion had also dispersed themselves through the towns and villages in the internal parts of the empire, while, in other places, the grossest idolatry was practised: such as the worship of the heavenly bodies, the winds, trees, cows, serpents, &c. All this had hitherto passed unnoticed: but, in the reign of Zara Jacob, some families being accused of worshipping the cow and serpent, were brought before the king, who pronounced sentence of death upon them. Their execution was followed by a royal proclamation that whoever did not carry on his right hand an amulet with these words upon it, 'I renounce the devil for Christ our Lord,' should not only forfeit his personal estate, but be liable to corporal punishment. The spirit of persecution thus begun, quickly diffused itself, and an inquisitor was appointed to search for criminals. This was Amda Sion, the king's chief confident, who pretended to all that absurd and austere devotion common to hypocrites; and, at the same time, assumed no uncommon parade and attendance. He kept a number of spies, who brought him intelligence of those who were secretly guilty of

any idolatrous or treasonable practices; when, proceeding with his attendants to the house of the delinquent, he would cause the family first to bring forth refreshments for himself and his party, and then order the whole to be put to death. Among those who suffered in this barbarous manner were the king's two sons-in-law, who had been accused by their wives, the one of adultery, and the other of incest. After this the public dislike to these measures became so great, that no farther persecution took place during this reign. The attention of the emperor was also now called to the state of his affairs in the different provinces. The Moorish provinces, becoming rich by the extensive trade they carried on, frequently employed their wealth in exciting rebellions. Zara Jacob now, therefore, divided the empire more distinctly, increased the number of governments, and set about repairing the churches, which had fallen into decay. So zealous was he in this respect, that having heard of the destruction of the church of the Virgin in Alexandria by fire, he instantly built another in Ethiopia to repair the loss. The last public transaction of his reign was the quashing of a rebellion in the interior. In the decline of his life his domestic conduct becomes a dark stain upon his memory. The mother of the heir apparent, wishing to see her son on the throne, began to form schemes to oblige his father to take him into the government. These being discovered, her husband cruelly caused her to be whipped to death; and finding that his son afterwards performed certain solemnities at her grave, ordered him to be loaded with irons, and banished to the top of a mountain.

On the accession of Bæda Mariam, in 1468, the old law for imprisoning all the royal family was revived, and a mountain, named Geshan, or Amba-geshen, selected for the purpose. See Amba-Geshen. Having thus secured himself from any danger of a rival, to ingratiate himself with the people, he proclaimed a pardon to all those who had been banished; after which he prepared for war. On this the king of Adel, being alarmed, sent ambassadors requesting the continuance of peace. The Abyssinian monarch told them, that his design was to destroy the Dobas; a race of shepherds very wealthy, but extremely barbarous, professing the pagan religion, and greatly resembling the Gallas; and that he was determined not to make war on them as a common enemy, but to extirpate them as a nuisance. The king of Adel no sooner received this intelligence than he invited the Dobas to send their women and children, with their most valuable effects, into his kingdom; but Bæda, having obtained notice of their design, seized an avenue through which they must necessarily pass, and massacred every one of the party. After this, entering their country, he committed such devastations, that they were glad to submit, and even to renounce their religion, to free themselves from such an enemy. The emperor then turned his arms against Adel, where they were attended with equal success; but while Bæda himself was advancing towards the capital, he was seized with the pains of death.

The modern acquaintance of Europeans with Ethiopia or Abyssinia, took place about this time. Some intercourse by individuals had been carried on between this country and Italy; but the knowledge of it conveyed to Europe in this manner was very imperfect and obscure. Even its situation had been forgotten, and though some confused notions were entertained of a distant Christian prince, who was likewise a priest, Marco Paulo, the famous Venetian traveller, affirms that he had met with him in Tartary; and it was universally agreed that his name was Joannes Presbyter, Prete Janni, or Prester John. When the Portuguese began to extend their discoveries along the coast of Africa, more certain intelligence concerning this prince was obtained. Bemoy, one of the kings of the Jalosses, a nation on the western coast of Africa, had assured the Portuguese navigators of the existence of such a prince so strongly, that king John II. determined to send ambassadors to him; and the discovery was of the greater consequence, that a passage to the East Indies was now attempted both by land and sea. The ambassadors were named Peter Covillan and Alphonzo de Paiva. These were sent to Alexandria, whence they set out on their journey, to explore the sources of the Indian trade, the principal markets for spice, &c., but, above all, to learn whether it was possible to arrive at the East Indies by sailing round the continent of Africa. In the prosecution of this scheme our two travellers arrived at Cairo; thence they went to Suez, and from that to Aden, a city beyond the straits of Babel-Mandel. Covillan then set sail for India and De Paiva for Suakem. The latter lost his life without making any discovery; but Covillan passed over to Calicut and Goa. Thence he returned to Africa, visiting the gold mines of Sofala, and passing from thence to Aden and to Cairo, where he was met by two Jews with letters from the emperor of Abyssinia. One of these was sent back with letters to that monarch; but with the other Covillan proceeded to the island of Ormus in the Persian Gulf. Here they separated; the Jew returning home, and Covillan repassing the straits of Babel-Mandel, whence he proceeded to Aden, and afterwards entered the Abyssinian dominions about A. D. 1490.

When Covillan arrived in Abyssinia, Alexander, the son of Bædal Mariam, was emperor, and was employed in levying contributions on his rebellious subjects. He met with a kind reception, and was conveyed to the capital, where he was promoted to the highest posts of honor; but was never allowed to return to Europe. The intelligence, however, which he transmitted to the court of Portugal, proved of much importance. He not only described all the ports in India he had seen, with the situation and wealth of Sofala, but advised the king to prosecute the discovery of the passage round Africa with the utmost diligence; affirming that the Cape at the southern extremity of the continent was well known in India; and accompanying the whole with a chart which he had obtained from a Moor and which showed exactly the situation of the Cape and the neighbouring countries. Alexander seems to have been endowed with many good qualities. His reign however was disturbed

by plots and rebellions, which at last proved fatal to him. From his early years he desired to make war with the king of Adel, who seems to have been the constant rival of the Ethiopic princes. But the Adelian monarch, sensible that he was not able to cope with such a powerful adversary, took an effectual way of securi himself, by gaining over a party at the Abyssinian court. In this he succeeded so well, that when Alexander was about to invade Adel, Za Saluce the prime minister, with many of the principal nobility, were in the interest of his adversary. Not being apprised of their treachery, Alexander entrusted this minister with the command of a great part of his forces; and with these the latter abandoned him in the heat of an engagement. Alexander and the few troops who remained with him, however, were so far from being disheartened by this treason, that they seemed to be inspired with fresh courage. The emperor having killed the standard-bearer of the Adelians, and thus become master of the green ensign of Mahomet, the enemy began to give way, and, on his killing the king of Adel's son, they quitted the field. But the victory was not complete, nor was Alexander in a situation to pursue his advantage. Having in vain challenged the Moors to a second engagement, he returned with a design to punish his perfidious minister Za Saluce, who had endeavoured to excite the governors of all the provinces to revolt as he went along. The traitor, however, had laid his plots so well, that Alexander was murdered in two days after his arrival in the capital. Za Saluce did not, however, enjoy the rewards he expected for his treachery; for, having attempted to excite a revolt in the province of Amhara, he was attacked by the nobility there; and, his troops deserting him, he was taken prisoner, his eyes were put out, and he was exposed on an ass to the derision of the people.

Alexander was succeeded by an infant son, who reigned only seven months; after which his younger brother Naod was chosen king by the unanimous voice of the people. He proved a wise and virtuous prince; but the late misfortunes, together with the corruption introduced at court, by the Mahommedans, had much unhinged the government. On his entering upon the government, he found it necessary to prepare against a new enemy, viz. Maffudi, prince of a district named Arar, near Adel. This chieftain being a man of enterprising disposition, and a most violent enthusiast in the Mahommedan cause, made a vow to spend forty days annually in some part of the Abyssinian dominions during the time of Lent. For this purpose he kept a small body of veteran troops, with which he fell sometimes on one part, and sometimes on another, of the frontiers, putting to death without mercy such as made resistance, and carrying off the rest for slaves. He continued this practice, it is said, for thirty years, beginning exactly on the first day of Lent, and proceeding gradually up the country as the term advanced: and his progress was facilitated by the superstition of the people, who kept that fast with such rigor as almost entirely to exhaust their strength. Now, however, he experienced a prodigious reverse of fortune. Naod having enjoined his soldiers to live in the same full and free manner during the fast as at any other time, and having set the example himself, marched out against the enemy; who, being ignorant of the precaution taken, advanced with his usual confidence of success. The Abyssinian monarch, still pretending fear, as if on account of the weakness of his men, pitched his camp in a strong position, but left some passages to it open, that the enemy might be induced to attack him. The consequence of which was, that almost every one of them was cut off. On this the king of Adel sent ambassadors to solicit a continuance of peace with himself; which was granted, on condition that he restored all the slaves whom Maffudi had carried off in his last year's expedition. Naod, having thus freed his country from the danger of a foreign invasion, applied himself to the cultivation of the arts of peace, and reforming the manners of his subjects, in which he spent the remainder of his days. He died in 1508, after a reign of thirteen years; and was succeeded by his son David III., a child of eleven years of age; upon whom the empress Helena, widow of Bæda Mariam, had interest enough to get the crown settled.

The aspect of affairs in Ethiopia was now quite changed by the interference of the Turks. That people having conquered almost the whole of Arabia to the Indian Ocean, being likewise on the point of reducing Egypt, and possessing great advantages over their adversaries in the use of fire-arms, now projected the conquest of India also. In this indeed they had been hitherto checked by the valor of the Portuguese; but, as this conquest remained a favorite object with them, they did not abandon the attempt. All along the countries which they had conquered, they exacted enormous contributions from the merchants, vast numbers of whom fled to the African side of the Red Sea, and settled on the coast of Adel. The Turks, surprised at the increase of trade in this country, which they themselves had thus occasioned, resolved to share in the advantages of it. For this purpose they took possession of Zeyla, a small island in the Red Sea, directly opposite to the coast of Adel, and erected a custom-house; thus threatening both Adel and Abyssinia with a most formidable rival. Helena, sensible of the dangerous situation of the empire, now thought proper to enter into an alliance with the Portuguese. The ambassador from Portugal, Covillan, as we have stated, was denied the liberty of returning to his own country, and had of late been treated with entire neglect. In the present emergency, however, he recovered his importance. She united with him, in an embassy to Portugal, one Matthew, an Armenian merchant, and a young Abyssinian of noble family; but the latter died by the way. The letters they carried are by Mr. Bruce supposed to have been partly the work of Covillan, and partly of the less experienced Abyssinian confidants of the empress. They begin with telling the king, that Matthew would give him information of her whole purpose, and that he might depend on the truth of what he said; and concludes with soliciting a force sufficient to destroy the Turkish power. It is said, that a third

part of Abyssinia was offered, in case her requisitions were complied with; but this, as well as the embassy itself, was always denied by David when he came of age. Matthew, having arrived at Dabul in the East Indies, was seized as a spy, but relieved by Albuquerque the viceroy of Goa; not indeed out of any regard to his character as ambassador, but because he himself had a design pon Abyssinia, and he now used his utmost endeavours to induce Matthew to deliver his letters to him; which, however, he constantly refused. He boldly asserted the sacredness of his character as an ambassador, and told the viceroy and clergy, that he had with him a piece of the wood of the true cross, sent as a present to the king of Portugal; requiring them under pain of sacrilege, to respect the bearer of such a precious relic, and to celebrate its arrival as a festival. This last request was instantly complied with, and a solemn procession instituted; yet, after a little regard appears to have been paid to him; and he could not obtain leave to depart for Portugal till 1513, which was three years after he first arrived in India.

Maffudi in the mean time, having recovered from his late defeat by Naod, formed alliances with the Turks in Arabia, and renewed his depredations on the Abyssinian territory. Such a number of slaves had been, by his assiduity, sent to Mecca, that he was honored with a green silk standard (an emblem of the true Mahommedan faith), and made sheik of Zeyla. The king of Adel now determined to seek his alliance. Having accomplished this, the two princes invaded Abyssinia with their joint forces, and in one year carried off 10,000 Christian slaves, so that a general terror was spread over the empire. David, impatient of the injuries of his people, determined to raise an army, and head it in person as his ancestors had done, contrary to the advice of the empress, who wished him to employ some of his veteran officers. A very powerful army, however, was raised, and he took the road to Aussa the capital of Adel, detaching a part of his forces under an officer called the Betwudet, to meet the Moorish army, who were then ravaging Abyssinia. He ordered the Betwudet to allow them to enter certain agreed defiles; and before they could get through, he himself, with the main body of the army, marched to attack them at the other end. Thus the Moors were completely surrounded, and were farther dispirited by the conduct of Maffudi, who, on the morning of the engagement, told the king of Adel, that his own time was now come; that he had been certainly told by a prophet, long ago, that if this year (1516) he should fight the king of Abyssinia in person, he should lose his life; and therefore advised the king of Adel to make the best of his way over the least steep part of the mountain before the engagement began. Maffudi, however, as soon as he supposed the king of Adel to be out of danger, sent a trumpet to the Abyssinian camp, with a challenge to any man of quality in the army to fight him; on condition that the party of the victorious champion should be accounted conquerors, and that the armies should immediately separate without further bloodshed. The challenge was accepted by a monk named Gabriel Andreas; who, in the reign of Bæda Mariam, had been condemned to lose the tip of his tongue for speaking slightly of the king's proclamation of amnesty. Maffudi showed no reluctance to present himself; but received a stroke from his antagonist with a two-handed sword, which nearly cut him in two. Andreas with a second blow struck off his head; and throwing it at the king's feet, exclaimed, there is the Goliath of the infidels. A general engagement now ensued, notwithstanding the terms stipulated. The Moors were quickly repulsed and driven through the defile. At the other end they were met by the Betwudet, who drove them back to the king's forces; so that at last, being compelled to fly to the mountains, they were all slaughtered by the peasants, or perished with hunger. This victory was gained over the Moors by David in July 1516, and on the same day the island of Zeyla in the Red Sea was taken, and the town burnt by the Portuguese fleet under Lopez Suarez de Alberguiera.

For the Abyssinian ambassador, Matthew, had been received with the greatest marks of respect in Portugal. The king prepared an embassy in return, at the head of which he placed Don E. Galvan, and sent home Matthew on board the Indian fleet commanded by Lopez. The Portuguese ambassador, though otherwise a distinguished man, was very unfit from his age, being now eighty-six, for such a long and perilous voyage. He died on the island of Camaran in the Red Sea; but a successor to his office was provided on board the fleet, and when, after a variety of adventures on the coast, Matthew repaired to the emperor's court, he was accompanied by Roderigo de Lima, and fifteen Portuguese attendants. After a tedious and perilous journey, which occupied the ambassador from the 16th of April to the 18th of October 1520, he arrived with his retinue within about three miles of the Abyssinian camp. His reception was by no means favorable; for, instead of being admitted to the presence of the emperor, he was waited on by an officer of state, who caused him to retire three miles farther from the camp: and it was not till five years afterwards that he was enabled to finish the business of his embassy, and obtained leave to depart for Europe.

At last the Abyssinian emperor, having resolved to send a new embassy to Portugal, allowed don Roderigo to depart, but detained two of his people. He at the same time despatched Zaga Zaab, an Abyssinian monk, as his own envoy. This intercourse between two such distant nations, however, greatly alarmed the Mahommedan powers. Selim I., the Turkish sultan, having been constantly defeated by the Portuguese in the east, and alarmed at the thought of having a fleet of that nation in the Red Sea, where they might annoy his settlements on the coast of Arabia, determined to carry his arms to the African side; while the king of Adel having strengthened himself by alliances with the Turks in Arabia, was now become a very formidable enemy. This soon appeared in the new wars with the Adelians; who totally defeated the Abyssinian monarch with the loss of almost all his great officers and prin-

cipal nobility. The hostile army was commanded by Mahomet surnamed Gragné i. e. left-handed, the Turkish governor of Zeyla. The fortune of the war now entirely turned in favor of the Adelians and Turks; the emperor was defeated in every battle, and hunted from place to place. At last the Moors, finding no necessity for keeping up an army, over-ran the whole empire in small parties, plundering and burning the towns and villages, and carrying off the people for slaves. This destructive war continued till 1537; when Gragné sent a message to the emperor, exhorting him not to fight any longer against God, but to make peace while it was in his power, and give him his daughter in marriage: on which condition he would withdraw his army. David, however, refused to submit: replying, that he put his confidence in God, who at present only chastised him and his people for their sins; but that Gragné himself being an infidel, an enemy to the true religion, could not fail of coming shortly to a miserable end. The invincible constancy, with which this monarch bore his misfortunes, surprised both his friends and enemies. At last by the death of Ammer, a rebellious chieftain, and the successes which David himself had obtained, the affairs of Abyssinia seemed to revive; but still there was no probability of their being brought to a fortunate issue. An embassy to Portugal was therefore thought of in earnest; and John Bermudes, an attendant of Roderigo, who had been detained in Abyssinia, was placed at its head. To his temporal character of ambassador was added that of abuna, primate or patriarch. John, who was not a clergyman originally, being a bigot to the popish religion, would not accept of his new dignity but with the proviso, that his ordination should be approved by the pope: to effect which he passed through Arabia and Egypt to Italy. On his arrival at Lisbon, he was acknowledged by John III. king of Portugal, as patriarch of Alexandria, Abyssinia, and of the sea: for this last title had also been conferred upon him by his holiness. Entering then upon the purpose of his embassy, he threw Zaga Zaab, his predecessor at the court of Portugal, into irons; and so forcibly represented the distresses of the Abyssinians to the king, that an order was issued for 400 musketeers to be sent by don Garcia de Noronha to their relief. To accelerate the arrival of these succours, John himself proposed to sail in the same fleet with don Garcia; but his voyage was delayed for a whole year by sickness, occasioned, as he supposed, by poison given him by Zaga Zaab. After his recovery, he set sail for India, but here the death of don Garcia occasioned another delay. It was resolved, however, that don Stephen de Gama, who had succeeded Garcia, should undertake an expedition to the Red Sea, in order to burn the Turkish galleys at Suez. But, the enemy having received intelligence of the intended voyage, their vessels were withdrawn, and the Portuguese fleet, having found considerable difficulty in obtaining provisions, at last attacked the town of Arkeeko, putting all the inhabitants to the sword; and sent the head of the governor to the Abyssinian court. During this interval a considerable change had taken place in the affairs of that court. David had been reduced to the greatest distress; and a Mahommedan chief, called vizier Mugdid, had made a successful attack upon the unprotected fortress at Geshen, where the imperial family resided, and slaughtered the whole of its inmates. This last disaster seems to have been too great for the fortitude even of this heroic prince: he died the same year, 1540.

Claudius, the son and successor of David III., though only eighteen years of age, soon revived the affairs of the empire. On his accession, the Moors formed a league among themselves to crush him at once; but Claudius anticipated this; and falling upon a considerable party, in the neighbourhood of his own camp, totally defeated them; the pursuit lasting two days. His enemies now found it necessary to concentrate their forces, and spend the rainy season in such parts of Abyssinia as they had conquered, without venturing to return into Adel. They at last placed themselves under the command of an experienced chief, named Jonathan: and determined to attack the Abyssinians without delay. But in the camp of Claudius all their plans were known, and any attempt upon it would have been desperate. He finally determined to surprise the confederates, and, sallying out in the night, defeated them with great slaughter, and sent the head of Jonathan to his allies by a prisoner, the only one he had spared. The Abyssinians now flocked in from all parts to join their prince; and even many of the Mahommedans, having experienced the lenity of his government, chose rather to submit to Claudius than to the Turks and Adelians. His affairs were in this situation when the Portuguese arrived, and the admiral, Don Stephen de Gama, lost no time in bringing forward the armament designed by his sovereign to assist the Abyssinians. The command was given to Don Christopher de Gama, the admiral's youngest brother; and almost every man on board the fleet was ambitious to share in the enterprise; 100 musketeers having first arrived, they were appointed by the Portuguese general as the emperor's guard. After eight days march through a rugged country, Don Christopher arrived in presence of the Turks, and received a defiance in very insulting terms from Gragné, their general. An engagement took place on the 25th of March, 1542; in which both commanders were wounded, but no other result of consequence followed.

The Portuguese retired into winter quarters; while Gragné remained in their neighbourhood, in hopes of forcing them to a battle before they could be joined by the main body of the Abyssinian forces: he in the mean time doubled the number of his horse, and increased his train of artillery. Still in a second engagement, which now ensued, the superiority of the Portuguese appeared great, and the battle was decidedly in their favor, until Gragné ordered some artillery to be pointed against the Abyssinians, who, being unaccustomed to fire-arms, fled at the first discharge. Don Christopher, rashly exposing himself, was singled out and shot through the arm. This produced such con

fusion, that a total defeat of his forces, with the loss of their camp, ensued; the barbarians, according to custom, putting to death all the wounded and defenceless. The Portuguese general obstinately refused to fly, and was at last put into a litter by force, and sent off along with the Abyssinian ladies and patriarch. Arriving in a wood where he entered a cave, to have his wound dressed, he was betrayed by a female to a party of the enemy, and carried in triumph to Gragné. Here, after mutual insults, the barbarian in a fit of passion cut off his head; which was sent to Constantinople, and his body cut in pieces and dispersed throughout Abyssinia. But this piece of cruelty was quickly punished. The Turks were irritated to the last degree against their general at the loss of Don Christopher's expected ransom, and abandoned him in large numbers. Gragné, thus left to decide the quarrel with his Africans, was in another engagement, on the 10th of February, 1543, defeated by Claudius, and killed by a Portuguese valet de chambre of Don Christopher's. His wife and son were taken prisoners, with Nur, the son of Mugdid, who destroyed the royal family; and happy it had been for Claudius, if he had retaliated, and put these prisoners to death.

We have already mentioned that John Bermudes was appointed, by the pope, patriarch of Alexandria and Abyssinia. He now began to insist that Claudius should establish the doctrines of the church of Rome throughout the empire, which he said his father David had engaged to do. Claudius, however, refused to alter the religion of the country; upon which those contentions commenced, which ended in the total expulsion of the catholics, and the cutting off all communication with Europeans. Claudius took every opportunity of showing his attachment to the Greek church, denying that he had made any promise of submitting to the see of Rome; and when Bermudes told him that he was accursed and excommunicated, and threatened to return to India with his countrymen, Claudius answered, that he wished indeed that Bermudes would return; but that he should not allow the Portuguese, nor any person to leave his territories without permission. The emperor, however, found it prudent to conciliate the other Portuguese, and succeeded so far with their commander Arius Dias, that he privately renounced the church of Rome, and was baptised into that of Abyssinia by the name of Marcus. The emperor now, therefore, regarding him as a naturalised subject, sent him a standard with the Abyssinian arms, to be used instead of those of Portugal. He had previously bestowed on him the captive queen of Adel, in marriage; and now raised him to the royal dignity, by giving him the kingdoms of Doar and Belwa. The altercation on the subject of religion becoming every day more violent, Bermudes was prohibited by the emperor from any further communication with the Portuguese; and, the latter having attempted in defiance of his authority to fortify their camp, he ordered it to be instantly attacked. The attempt, however, failing, he is said to have been advised by Marcus to consult his own safety, and break the power of the Portuguese by artifice. With this view he endeavoured to appease the patriarch by a valuable present; and then dispersed the European leaders into different parts of his empire. Such is the account given of this transaction by the Portuguese historians: but Mr. Bruce, after the Abyssinian annals, says that no quarrel ever took place betwixt Claudius and any of the Portuguese, except the brutish Bermudes, whom he was on the point of banishing to one of the rocks used as prisons in Abyssinia. At last Bermudes was persuaded to withdraw to India, where he remained neglected for two years, and then returned to Portugal. Claudius was scarcely freed from this troublesome priest, when he was threatened with the intrusion of others into his dominions. Ignatius Loyola, the founder of the order of the Jesuits, then at Rome, proposed to go in person to Abyssinia, to make a thorough conversion of both prince and people. The pope, however, who conceived that he might be of more importance to him in Europe, substituted in his place Nugnex Baretto, a Jesuit, whom he invested with the dignity of patriarch, and honored with a letter to Claudius. With these commissions, and a number of priests, Baretto sailed for Goa, then the only mode of passage to Abyssinia; on his arrival, being informed that the Abyssinian monarch had such an aversion to the church of Rome that there was no probability of his meeting with a favorable reception, he sent forward some clergymen of inferior dignity, with proper credentials, headed by Oviedo, bishop of Hierapolis, and Carneyro, bishop of Nice. These arrived safely at Masuah in 1558.

The emperor, supposing that a new supply of Portuguese soldiers had come from Europe, was happy to hear of their arrival, and, even when he found that they were only priests, resolved to give them a civil reception. But a more important object now claimed his attention. This was the appointment of a successor to the throne, Claudius having no son. A project was therefore set on foot for ransoming prince Menas, the emperor's youngest brother, who had been taken prisoner by the Moors in the time of David, and hitherto detained in captivity on a high mountain in Adel. A proposal was made to the wife of the late Gragné, who had escaped into Athara, that her son, who had been taken by the Abyssinians, should have his liberty, provided the emperor's brother should be restored. This was accepted; 4000 ounces of gold being added for the ransom of Menas. The widow of Gragné, as Mr. Bruce informs us, had been taken prisoner at the battle in which her husband was killed, but by means of Nur, the son of Mugdid, the murderer of the royal family, she made her escape into Athara. Subsequently, Nur offered her his hand, but she refused to marry any man, unless he brought her the head of Claudius. Nur, therefore, now governor of Zeyla, when Claudius marched towards Adel, sent him a challenge; and the emperor, though advised against the expedition by all his friends, did not decline the combat. This advice is said to have been dictated by a number of prophecies, that he should

be unfortunate, and lose his life in this encounter; prophecies which, in the present state of this country, were sure to occasion their own fulfilment. On the day of conflict all the attending Abyssinians fled on the first fire, leaving the emperor in the midst of his enemies, attended by only eighteen Portuguese, and twenty horsemen. These were all killed after a desperate resistance; the emperor himself receiving upwards of twenty wounds before he fell. His head was now brought by Nur to his mistress, who hung it up on a tree before her door, and here it remained, it is said, for three years. This fatal encounter took place on the 22d of March, 1559.

Menas, ascending the throne without opposition, found his affairs in great confusion, both from foreign and domestic enemies. The first of these was Radaet, a king of the Jews, who had a territory in the empire of Abyssinia; the capital of which was on a rock named Samen: which the emperor found impregnable. The cause of this quarrel was not known, but the event was unfortunate; the emperor being obliged to abandon the enterprise, after having bestowed a considerable time upon it. An attempt to assassinate him now followed, which was succeeded by a conspiracy among his principal nobles. They proclaimed Tascar, the nephew of Menas, emperor of Abyssinia: and assembled a powerful army to support his claim. But they were entirely defeated by Menas; Tascar himself taken, and thrown from the top of a precipice; and Isaac the Baharnagash, the leader of the conspiracy, himself escaped with difficulty to the confines of his own government. Here he entered into an alliance with the Turkish bashaw of Masuah; whom he put in possession of Dobarwa, with the country adjacent, which is considered as the key to the province of Tigré. Isaac strengthened himself also by an alliance with the Portuguese, and professed a great desire to embrace the Romish religion. The emperor was very apprehensive of the arrival of more Portuguese, for he had come to an open breach with Oviedo, the head of the European mission; but the latter had not sufficient interest to procure the supply he promised the rebels. An engagement took place without them, in which Menas was again victorious; though the battle was not so decisive as to terminate the rebellion. Menas died soon after this, and was succeeded in 1563 by his son Sertza Denghel, then only twelve years of age.

The beginning of Sertza Denghel's reign was disturbed by various factions. Isaac, with his allies, the bashaw and the Portuguese, seem to have remained for some time unmolested; and, in 1569, a kind of accommodation took place. Mr. Bruce only tells us however that 'Oviedo and the Portuguese did not appear at court.' Others say, that after the last battle with Isaac, their name became so odious to all the Abyssinians, especially to their monarchs, that they would never more suffer any of them to enter into the army. They were certainly however more favorably dealt with by the new emperor than they had been by his father. The Galla made frequent inroads into Abyssinia during this reign, and in 1576 a league was formed by Mahomet, king of Adel, with Isaac and the Turkish bashaw. The emperor, however, marched with such expedition, that he did not allow them time to join their forces; and, attacking them separately, eventually defeated them all. Almost the whole Moorish army was destroyed; but, while the emperor entered Adel on the east, he was informed that the Galla had invaded him on the west. Traversing therefore the whole breadth of the empire with the utmost expedition, he soon came up with these new enemies, who retired before him; and he now in turn invaded their country, and that of the Falasha, which he ravaged for four successive years. These Falasha profess the Jewish religion, and were then governed by a king named Geshen, who was killed, and his army utterly defeated by the Abyssinians, on the 19th of January, 1594. The victorious Sertza then hastened to encounter the bashaw of Masuah, who, confident of the superiority of his army, waited for him in a strong position. A desperate battle ensued; the event of which was doubtful, till Robel, commander of part of the emperor's household troops, who were armed with pikes, attacked the part of the Turkish horse where he saw the bashaw, and killed successively the officer who carried his standard, and that chieftain himself. This instantly decided the victory: the Turkish horse fled, and the rest of the army soon followed the example. The Moors were pursued to the island of Masuah; where, and in the neighbouring deserts, many perished with thirst. After this, marching towards the western part of his territories, the emperor proceeded to Narea, destroying the Galla as he went along. His last expedition was towards Damot, to chastise a rebellion there, and where he died from eating poisonous fish.

Jacob, his son, about seven years of age, was raised to the throne, and his nephew, Za Denghel, a rival, confined in an island of the lake Dembea.

An attempt was next made to seize Socinios, natural son to Facilidas, grandson of David III., who had likewise a claim to the throne. He, however, contrived to withdraw from the power of his enemies; and Za Denghel himself found means to escape to the mountains of Gojam. The empress-mother, with her two sons-in-law, governed Jacob till he was seventeen years of age; but, being now thwarted by him in their further views, declared him degraded from the imperial dignity, and proclaimed Za Denghel. Jacob left his palace in the night, and attempted in his turn to fly to the mountains of Samen, but was discovered, seized, and brought back to his rival, who banished him for life to Narea. All those who came into Abyssinia with Oviedo being now dead, the Romish religion languished for want of preachers, the last of whom died in 1596. Next year, however, Melchior Sylvanus, a vicar of the church at Goa, was sent on a mission to Abyssinia. He was succeeded by Peter Paez, the most learned and best qualified missionary that had as yet appeared here, in 1600; who taking up his residence at the convent of Fremona, in the province of Tigré, first applied to the study of the learned language of the Abys

sinians. In this he made such progress, as quickly to surpass the natives: after which he established a school, where the children of the Portuguese and Abyssinians were promiscuously taught, and their progress was spoken of at the court. On this (in 1604) he was sent for by the emperor; and, having vanquished the best theologians opposed to him, performed mass before the court, in the Romish manner: this was followed by a sermon, which, in elegance of diction, is said to have excelled any thing that had ever been heard there; and Za Denghel resolved to embrace the Catholic religion. Communicating this resolution to several friends, he soon after issued proclamations forbidding the observation of the Jewish sabbath, and wrote letters to pope Clement VIII., and Philip III. of Spain, desiring a new supply of teachers, to instruct his people in religion and the useful arts. This precipitate conduct had the effect which might have been expected. The Abyssinians, headed by one Za Selasse, prevailed on the abuna to excommunicate the emperor, and absolve his subjects from their allegiance. He then set out for Gojam, where, the people being remarkable for their aversion to the church of Rome, he found no difficulty in raising an army; and Za Denghel soon found, by the great desertion among his troops, how fearfully the excommunication had availed. John Gabriel, an experienced Portuguese officer, advised him to retire to some fortress, until his subjects should return to a sense of duty. This advice however was rejected; and a sanguinary battle ensued, hich at first the Portuguese seemed to carry every thing before them. In the other wing, however, the cowardly and treacherous Abyssinians deserted their emperor, who was quickly surrounded by his enemies, and, after great personal exertion, fell under the hands of the traitor Za Selasse

On Za Denghel's death, Socinios appeared as a candidate already in possession of the empire, and ready to support his right by force of arms. Za Selasse at first hesitated to acknowledge him, in expectation that Jacob would make his appearance, from whom he had received several flattering promises; but after much vacillation, he made proposals to join Socinios; and, though Jacob had sufficient influence to raise a more numerous army than his rival, the latter boldly advanced to give him battle; in which the over-confident Jacob perished. In this battle also was killed the wicked priest Abuna Petros, who had been the occasion of Za Denghel's death. By this victory Socinios was fully established on the throne, though his situation might still be accounted precarious, from the rebellious disposition of many of the provinces. He began with making a general proclamation of pardon, excepting only the murderers of Za Denghel, with whom he had been on terms of intimate friendship, and distinguished the Portuguese by his favors. He enlarged the territory possessed by the Jesuits at Fremona; after which he declared to Paez his resolution of embracing the Catholic religion, forwarding at the same time letters to the king of Portugal and to the pope, requesting more European troops. Before, however, any thing of importance could be done in religion, an impostor appeared, who assumed the name of Jacob the late king, pretending to have escaped from the battle; but so much injured in the face, that he kept one side of it covered to conceal his wounds. He hovered for some time amongst the Galla in the mountains, where he was finally assassinated by two young men, who had been outlawed for murder.

Another dangerous rebellion in this reign was headed by one Melchizedec, a servant of the late Sertza Denghel, but a man of great experience in war, and a bloody battle ensued, in which Sanuda, the emperor's general, was so totally defeated, that he alone had the good fortune to escape. On this Socinios sent Emana Christos with a considerable force to reduce the rebels, and a second engagement took place on the 9th of March, 1611, which was fought with great obstinacy on both sides: for some time the advantage appeared on that of the rebels; till Emana Christos pushed desperately forward to the place where Melchizedec himself was, who instantly turned his horse and fled; and his army soon followed his example. Melchizedec, however, was closely pursued, taken prisoner, and executed as a traitor.

News were now received that the whole country round the head of the Nile to the province of Tigré had revolted; so that there was a necessity for the immediate presence of the emperor in this tract of territory. His brothers, Emana and Sela Christos, were also employed against different rebel chiefs. A mountainous district named Gusman, on the Nile, was now completely laid waste. The men found in rebellion were uniformly killed, though, at the intercession of Peter Paez, the women and children, instead of being sold for slaves, were given to the Jesuits. The Gongas and Agows were next attacked with equal success, and still greater cruelty; one of their tribes, named Zalabassa, being almost entirely exterminated. Gideon, king of the Jews of Samen, having killed the guards who watched him, set at this time a new impostor, who took the name of Jacob, at liberty, and supported his cause. He soon collected a formidable army, with which he defeated the royal forces. This brought Socinios himself against him, who instantly attacked the Jewish monarch, and took a strong fortress of his named Massiraba by storm. Hotchi, Amba Za Hancasse, and Senganat, three other strong fortresses, shared the same fate; Gideon himself narrowly escaping with his life. The war was now resumed against the Gongas and Guba; whom the emperor annually invaded for the purpose of making slaves. In 1616 the emperor set out on an expedition against the Galla; but this was laid aside on the death of his eldest son, for whom he entertained a great affection. It was succeeded by a very cruel order against the Jews, whom Socinios now resolved to exterminate without any apparent occasion. His commands, however, were executed so punctually, that very few escaped; and, among the rest, their prince Gideon, perished. He was supposed to be immensely rich, and to have concealed his riches, which have since been sought for in vain by the

Abyssinians. The children of the murdered Jews were sold for slaves.

At last the emperor, being left for a short time at rest from rebellion, determined to make war on his neighbour the king of Sennaar. In this expedition he was assisted by one Wed Ageeb, a prince of the Arabs, who lived on the frontiers of Abyssinia. The allies proceeded with their usual cruelty, killing all the men, and selling the women and children for slaves. Vast numbers of cattle were also carried off; and the victorious armies returned with an immense booty. His next expedition was against Fatima queen of the Shepherds, otherwise called queen of the Greeks, who resided on the north-east of Atbara. In this also he proved successful, though less blood was shed than usual. All this time Peter Paez had applied himself with the utmost assiduity to the conversion of the Abyssinians, and had been attended in this undertaking with surprising success. His universal genius, and knowledge of the arts, came happily in aid of his zeal and learning, while the barbarous ignorance and savage manners of his antagonists tended to prejudice every one against their tenets. At last a public dispute was appointed between the catholic and the Abyssinian patriarch; in which the inferiority of the latter was very apparent. While the labors of Paez were proceeding in this prosperous way, letters arrived from pope Paul V., and Philip III. king of Spain, assuring him of their alliance and of the support of the Holy Spirit himself, provided he continued firm in his resolution of embracing the catholic faith. Socinios would have been better satisfied with an account of a reinforcement of soldiers; but, as matters stood, he resolved to submit in form to the pope, renounce the Greek church; and, to accomplish this, sent new ambassadors to Europe.

Socinios had now gone so far in favor of the catholic party, that he began to share the unpopularity of Za Denghel, and numberless conspiracies were formed against him. The conspirators were at this time supported, not only by the abuna, but by Emana Christos himself, the emperor's brother. Their first step was the very same which had been so successfully taken by Za Selasse in the time of Za Denghel, viz. to procure a sentence of excommunication on the emperor from the patriarch. He was then absent on an expedition against the Agows; but returned immediately; informing the abuna, that, if he did not recal the excommunication without delay, his head should pay the forfeit. This spirited declaration had such an effect, that the anathema was annulled, and the conspiracy dissolved. It was next resolved between Emana Christos, the emperor's brother, Julius his son-in-law, and Kesla Wahad, master of the household, to assassinate Socinios in his palace; and, on this failing, that of Sela Christos was attempted; because the emperor had taken the government of Gojam from Emana Christos, who was a schismatic, to give it to Sela, a violent catholic. The enterprise was begun by Julius; who issued a proclamation, that all those who believed there were two natures in Christ should leave the province of Tigré, where he was governor; and that such as were true friends to the Alexandrian faith should repair to his standard to fight for it. He then ordered the goods of all the catholics in Tigré to be confiscated; and marched into Gojam, to surprise Sela Christos. But here the whole scheme was baffled by the vigilance and activity of the emperor; who, hearing of what had been attempted, returned into that province before the conspirators had heard of his having left it. Julius was now very much disconcerted; but advanced to attack the emperor before he could be joined by Sela Christos, Simon himself (the abuna) offering to share his fortunes. He had been persuaded by the latter, that as soon as the imperial army should see him (Julius), they would abandon the emperor's standard and join him. On this, without farther consideration, he rushed into the camp of Socinios with very few attendants, and reached the emperor's tent before he was known. Here, however, the guards instantly despatched him; and his whole army, retreating in dismay, were pursued with great slaughter by the imperialists. By this victory the whole scheme of the conspirators was overthrown. But another soon followed, which arose out of a dispute concerning the sabbath; the Abyssinian church insisting on the observance of the seventh day of the week, and the Romish church on that of the first. The author of this rebellion was one Jonael, who drew together his forces in the country of the Galla. On this the emperor entered and laid waste their territories; on which one part of that people were disposed to afford protection to Jonael, and another to deliver him up: and the latter were soon bribed by Socinios to send him the head of the rebel. A more formidable enemy, however, still remained. The province of Damot was one of the most disaffected to Socinios in the whole empire; and hither the greatest part of the relig ous fanatics in the other provinces had retired. They now mustered an army of more than 12,000 men, among whom were 400 monks. Against these Sela Christos was despatched with about 7000 excellent troops; and as the general himself was a zealous Roman catholic, as well as most of his men, both parties imagined themselves sure of the protection of heaven. The two armies met on the 16th of October, 1620; when the monks made a most obstinate resistance, and did not yield till after 180 of them had been killed; but the rebels were finally and completely beaten. Socinios now determined openly to show his attachment to the church of Rome, and renounced the Alexandrian faith in the most explicit manner. The example of the sovereign, however, had very little effect upon his subjects: it only, in fact, urged forward a new rebellion. This, however, was put down, and Socinios persevered. At last a new set of missionaries, with a patriarch, Alphonso Mendez, at their head, arrived at Gorgora, the seat of imperial residence. This was in the beginning of 1626; and, at the first audience, it was agreed, that the emperor should take an oath of submission to the pope; a ceremony which was performed with the utmost splendor. Sela Christos, not contented with taking the oath, drew his sword, and denounced vengeance on 'those who fell from their duty.'

Excommunication was now pronounced against all who did not keep the oath: a proclamation was issued, that all priests should embrace the catholic religion under pain of death; and that every one, under the same penalty, should observe Lent and Easter according to the rules of the Romish church; while the new patriarch proceeded to re-ordain the clergy, to consecrate the churches anew, and to rebaptise the people.

We cannot follow the conseqences of this attempted change in detail: it will suffice to say, that neither the example nor authority of the emperor could wean the people from their attachment to the ancient faith: and, after repeated efforts to effect this, Socinios's own attachment to the Romish religion began to decline. In this disposition he set out for the country of Lasta, where Melca Christos had raised the standard of revolt; and the entrance to which was guarded by very high and rugged mountains. Among these the rebels had fortified themselves; but were driven from their posts by the king's troops, so that the latter imagined they had gained a complete victory. The rebels, however, descending suddenly upon them, cut off great numbers, and obliged the rest to make a precipitate retreat. They even rallied, and sustained an action, in which they lost 8000 men. On viewing the field of battle next day, prince Facilidas is said to have made a pathetic speech to his father. 'How *many* men have you slaughtered!' he exclaimed; 'how many more have you yet to kill! We are become a proverb even to the Pagans and Moors for carrying on this war; and for apostatising, as they say, from the faith of our ancestors.' The king made no reply, but the effect of the prince's words was soon apparent. And, when the patriarch upbraided him with his ingratitude to the catholics, he replied, that he had done every thing in his power to establish the catholic religion; that he had shed the blood of thousands, and had still as much more to shed; but that he should consider of the matter, and acquaint him with his final resolution. Next day, in a message to the patriarch, he recounted the many rebellions which had been excited on account of religion; and concluded with observing, that though the faith of Rome was not a bad one, yet the people of Abyssinia did not understand it. For this reason, he was determined to tolerate both: and immediately afterwards issued a proclamat on, declaring the Alexandrian faith restored, with the altars, liturgy, &c.; and stated, at the same time, that being now old and infirm, he himself resigned the empire to Facilidas. This remarkable proclamation was dated the 14th of June, 1632; after which Socinios retired from public affairs. He died on the 7th of September, 1632; and with him fell all the hopes of the Jesuits.

Facilidas was an inveterate enemy to the Romish faith. As soon therefore as he had obtained the government, the catholics were every where displaced: a letter was sent to the patriarch, informing him, that as the Alexandrian faith was now restored, it was necessary for him to leave the kingdom, and commanding him, with all his brethren, to leave their convents throughout the empire, and retire to Fremona, in Tigré. The emperor, understanding that they were about to solicit succours from Spain, sent orders to the patriarch instantly to deliver up all the gunpowder they possessed, and to prepare without delay to set out for Masuah. On this the infatuated priest applied for assistance to the Baharnagash, named John Akay, then in rebellion against the emperor; who conducted him and his associates to a strong fortress, named Adicotta; but afterwards a reed to sell them to the Turks, with whom Facilidas was now on friendly terms. He next became jealous of his uncle Sela Christos, as the only remaining Romanist of any rank in the empire. He absolutely refused to renounce his faith; and, notwithstanding his former services, was banished to an unwholesome district among the mountains of Samen: here, being detected in a correspondence with the jesuits, he became a martyr to the new faith, and was sentenced to be hanged on a cedar tree.

Though the catholic faith was now totally suppressed, the spirit of rebellion continued; and Melca Christos was as conspicuous as ever in it. He at one time made himself master of the capital, entered the palace, and was formally crowned emperor. Facilidas, however, having recruited his army, sent three able generals to attack him; who almost entirely cut off his forces, and killed their leader. This victory over Melca Christos was followed by several successful expeditions against the Agows and Galla; but, in the sixth year of the reign of this emperor, the rebels of Lasta chose the son of Melca Christos for their king, and made serious depredations on the neighbouring provinces. Before this rebellion could be suppressed, Claudius, the emperor's brother, placed himself at the head of another. He had not the same good fortune with the rebels of Lasta; but was quickly defeated, taken prisoner, and banished to a mountain called Wechne; which served from that time for the imprisonment of the blood royal. The latter, however, weary at last of the contention, submitted unconditionally to the emperor; who, though he at first affected to treat them with severity, soon after released their leader from prison, and bestowed upon him large possessions in Begemder, with his daughter Theoclea in marriage. Facilidas died in October 1665, and was succeeded by his son Hannes I.

Hannes was zealous for the Christianity his forefathers had professed; and, in the beginning of his reign, issued a proclamation forbidding the Mahommedans to eat any flesh but what was killed by Christians; but so far was he from favoring the catholics, that he ordered all their books which could be found in the empire to be burnt. Much of his reign, which lasted but fifteen years, was spent in regulations of the church matters, and in contentions and trifling disputes with the clergy. He died on the 19th of July, 1680.

Yasous, who succeeded with universal approbation, is described as a prince of very amiable qualities. Having visited those of the royal family who were confined on the mountain of Wechne, he found them in the most miserable condition; their revenue having been ill paid by his father, and embezzled by their keepers. He

assigned a large tract of territory, and an ample revenue, for the maintenance of the princes; who, though left at perfect liberty to depart, unanimously determined to return to their former state of confinement; and, during the whole of his reign, no competitor for the crown ever made his appearance from among them. Yasous, however, had soon to encounter a violent irruption of the Galla, headed by Isaac, a grandson of Socinios, while the Agows and other malecontents were ready to join him as soon as he should pass the Nile. The emperor, however, entirely disconcerted the scheme by his activity; and Isaac himself was taken and put to death.

The most memorable events in the reign of Yasous I. regard religion, and a renewal of the correspondence betwixt Europe and Abyssinia; of which Mr. Bruce gives a detailed account. It was pretended, that, on the expulsion of the Jesuits from Abyssinia, a great number of Catholic Christians had fled into the neighbouring countries of Nubia and Sennaar, where they were so grievously oppressed by the Mahommedans, that without some spiritual assistance, they would be under the necessity of renouncing their religion. This story being confirmed by two Franciscans of Cairo, the cause of these supposed Christians was eagerly espoused by the religious in Italy, and a new mission was set on foot at the expense of the pope for their relief, under the title of the Ethiopic mission. The missionaries had it also in charge to penetrate if possible into Abyssinia, to keep up the catholic faith, until a better opportunity should offer of attempting to convert the whole nation. For this purpose a convent was procured for them at Achmim in Upper Egypt; and permission was granted to settle two of their body at Cairo independent of the fathers of Palestine. While these transactions passed in Italy and Egypt, Louis XIV. of France was in the height of his glory. A scheme was devised by the Jesuits of inducing the emperor of Abyssinia to send an embassy to France; after which they hoped that they might be replaced in the Ethiopic mission. They even applied to the pope to decide which of the two orders should make the attempt to enter Abyssinia; but received no other answer, than that those who were most expert should do so. The mission therefore now fell into the hands of two persons of opposite professions; viz. Paschal, an Italian Franciscan, and Brevedent, a French Jesuit. In the mean time an unexpected incident made way for the admittance of missionaries into Abyssinia. Yasous and his son had both been attacked by a scorbutic disorder, which threatened to end in leprosy; on which one Hagi Ali, a Mahommedan factor at Cairo, received orders, on his return to Abyssinia, to bring with him an European physician. This man, who had been acquainted with friar Paschal, at first proposed that he should accompany him to Abyssinia in the character of a physician; and take a companion of his order with him. But this scheme was frustrated by Maillet the French consul, who represented to Hagi Ali, that friar Paschal understood nothing of medicine; but recommended Charles Poncet, a French chemist and apothecary, as a most able physician, with father Brevedent, the Jesuit, to attend him as his servant. They arrived safely at Gondar in July 1699, but here Brevedent died on the 9th of August; Poncet however lived to execute his commission, by making a complete cure of his royal patients; and, on the 2d of May 1700, set out on his return for Europe. A main end of this undertaking, to procure an embassy from Abyssinia to the French monarch, was also gained. An ambassador was procured, but M. Maillet, hearing of his low origin, thought proper to call in question the authenticity of his mission, branded Poncet himself as a liar, and would not allow the Abyssinian ambassador to proceed to France.

An embassy sent from France to Abyssinia, at the instigation of the Jesuits, was equally unfortunate. The person appointed as ambassador was M. de Roule, vice-consul at Damietta. He is characterised by Mr. Bruce as ‘a young man of some merit, who had a considerable degree of ambition, and a moderate skill of the languages spoken in the east; but was absolutely ignorant of that of the country to which he was going, and, what was worse, of the customs and prejudices of the nations through which he was to pass.’ The Franciscans took advantage of this, and are accused of having procured his murder, which took place at Sennaar, just after that of Yasous the Abyssinian emperor, who fell by a conspiracy of his wife and son.

Yasous was succeeded by his son Tecla Haimanout. Before his death, he had despatched a message to the king of Sennaar, requiring him to afford M. de Roule protection at his court, and a safe conduct from it; but, when the messenger was within three days' journey of the capital of that kingdom, he heard of the assassination of his master. On this he returned in great haste to Gondar, to have the letters of protection renewed by Tecla Haimanout. This was readily done: but now, before the messenger could reach Sennaar, he was informed that De Roule was also assassinated. The Abyssinian monarch, provoked at this violation of the law of nations, resolved on hostilities against the king of Sennaar; and assembled an army for this purpose. But a rival candidate for the throne, named Amda Sion, was set up against him by the friends of his father Yasous, and had been for some time privately collecting troops. In the issue (in 1706) the emperor himself was assassinated, and succeeded by his uncle Tiffilis, or Theophilus; whose reign, was principally occupied in punishing the murderers of his two predecessors. He died in September 1709.

Oustas, the new monarch, was elected by the army, and hardly seated on the throne when a dangerous conspiracy was formed against him by the very parties who had placed him on it. He baffled their designs, however, by seizing the principal conspirators. After this he undertook an expedition against the Shangalla, on a principle, now becoming common, of hunting these poor people for the sake of making slaves. In this he met with great success, until recalled to his capital by the death of his prime minister, Tafa Christos. Soon after this he was taken suddenly ill, and, a few days before he died, David IV.

son of Yasous was proclaimed his successor. He was crowned on the 30th of January, 1714.

It was the custom to call a convocation of the clergy on the accession of every new emperor; this assembly was now very fully attended, and the monks insisted upon being summoned on the occasion; more especially as a new abuna was come from Egypt, and the lenity shown to the catholics by Oustas had excited the jealousy of the Abyssinian clergy. Three Romish priests, whom he had protected and supported for some time, were by this holy fraternity condemned to be stoned to death; and the sentence was instantly executed by the furious and ignorant multitude. The priests next insisted that Abba Gregorius, who had acted as an interpreter to the three priests, should also be put to death; but this was prevented by David, who found upon enquiry that he had only done so in obedience to the express command of Oustas. Other disputes now arising among themselves, and the sitting having become completely riotous and seditious, the emperor sent against them a body of Galla; who killed upwards of 100 of the ringleaders, and then, sallying out into the street, destroyed indiscriminately every one they met. The emperor thus became completely hated in his capital, and numberless conspiracies were talked of; but, before any pretender to the crown appeared, he fell sick, the cause of which was found to be poison; and died the 9th of March 1719, in great agony.

David IV. was succeeded by his brother Bacuffa; who, in the beginning of his reign, sought out with great severity all the nobility who could be supposed to have had any share in the conspiracies of former reigns. In the latter part of it he became much more mild, and was beloved by his subjects.

He was succeeded 1729 by his son Yasous II. who continued long under the regency of his mother; and was, afterwards, like all his predecessors, disturbed continually with seditions and rebellions. In one of these the city of Gondar was made a field of battle, and was so frequently set on fire, as to be almost entirely reduced to ruins. Having at last reduced his subjects to obedience, he applied himself to the arts of peace, repairing and ornamenting his palaces, &c. At last, being incensed at the publication of a severe satire against him, under the title of The expeditions of Yasous the Little, he determined on an expedition against Sennaar, from which, after one or two partial reverses, he returned triumphant to Gondar. In one action, however, he is said to have lost all those holy relics, which it was usual in Abyssinia to carry into the field battle. Among these was a picture of the crown of thorns which was put upon our Saviour's head; some pieces of the cross upon which he suffered; and a crucifix which had spoken on many occasions! They were, after the battle, fortunately redeemed by the priests for 10,000 ounces of gold. and, on their arrival at Gondar, the greatest rejoicings were made. Soon after these transactions, the abuna died, and, to defray the expense of sending for a new one from Alexandria, Yasous was obliged to lay a tax upon all the churches. Three priests, consigned to the care of as many Mahommedan factors, were sent to Egypt for the new patriarch; but they were detained for some time. It was found that the naybe of Masuah had robbed these messengers of half the money, and Michael, the governor of Tigré refused to punish him. Yasous therefore sent a body of troops into Tigré to bring him Michael's head; but at the intercession of the principal officers, he was pardoned, and became one of the most dutiful and zealous of his subjects. This emperor had been married when very young to a lady of Amhara, by whom he had two sons named Adigo and Aylo; but as she attempted to interfere in matters of state, he was persuaded by his mother to banish both her and her children to Wechné. After this his mother selected for him a wife from among the Galla; a people of all others the most obnoxious to the Abyssinians, both on account of the barbarity of their manners, and the continual wars which from time immemorial had taken place between the two nations. The new empress was the daughter of one Amitzo, a prince who had hospitably entertained Bacuffa before he became emperor. A prejudice against her, however, against her offspring, and the emperor himself, never to be effaced, now took place among the Abyssinians; but this did not show itself during the reign of Yasous. He died on the 21st of June, 1753, in the twenty-fourth year of his reign, and is said to have been poisoned by his mother's relations.

Joas, his son by the Galla princess, succeeded without opposition. The discontent which had taken place, about the power assumed by the relations of the empress dowager, now began to appear; and it was complained that a relationship to her was the only way to preferment. On the accession of Joas, a party of Galla horse, said to be about 1200 in number, were sent to Gondara, as the portion of his mother: these were quickly followed by a number of private persons from motives of curiosity, or hopes of preferment, who were embodied to the number of 600 into a troop of infantry. The great favor in which these people were at court, soon induced others to make their appearance. Two of the emperor's uncles were sent for by his express order, and brought with them a troop of 1000 horse. By the time they arrived the empress was dead; but her two brothers, Brulhe and Lubo, determined to support the family party. This was easily effected; every thing was governed by Gallas: even the emperor himself affected to speak their language; while the Abyssinians were to the last degree mortified, at seeing their inveterate enemies thus establishing a dominion over them in the heart of their own country. At last Joas appointed his uncle Lubo to the government of Amhara, which produced excessive discontent; and he retracted his nomination, lest a civil war should ensue. In the mean time, the Abyssinian prime minister, Welled De L'Oul, died. He had hitherto moderated the fury of the opposite parties by his prudent conduct; but no sooner was he dead, than a most dreadful civil war took place. The whole empire was divided into two great factions: at the head of the one was the empress dowager, mother of Yasous II.; at the

head of the other, Joas the emperor, with his Galla relations. We cannot detail their ferocious contests. They were brought to a crisis by the emperor's bestowing the government of Begemder upon Brulhe, in the place of Mariam Barea, an accomplished nobleman, son of the late governor.

After a desultory warfare between the rivals, Joas despatched an express for the old servant of his father Suhul Michael, investing him with the dignity of Ras, by which he became possessed of unlimited power, civil and military. Michael himself had long foreseen that matters would come to this crisis, and had provided for it. He set out with an army of 26,000 of the best soldiers in the empire, of whom 10,000 were armed with muskets. Though the subsistence of these troops was abundantly provided for by the miserable inhabitants of the provinces through which he passed, he insisted on a contribution in money from all the districts within a day's march of his line of progress, and on his arrival at the capital took possession of all the avenues, as if he meant to besiege it. This at first produced a universal consternation. Instead of offering any hostility, however, he waited with the utmost respect on the emperor. No sooner had he done this than he established so rigid a police, that a very short time after he entered the city, a loaf of bread, a bottle of water, and an ounce of gold, were exposed in the market-place on the head of a drum night and day, without being stolen. This was the more remarkable as there was then a scarcity of provisions, and but a scanty supply of water in the city. Michael next prepared for his expedition against Mariam Barea, in which Joas accompanied him. An engagement at last took place at Nefas Musa, on the extreme borders of Begemder, when Mariam could not retreat without quitting the province. As the royal army was both ably commanded, and more than double the number of the rebels, victory was not long doubtful. Mariam, with twelve of his officers, took refuge in the country of the Galla; but were immediately delivered up by that people. He was put to death by Lubo the brother of Brulhe, who is himself said to have cut his throat, and afterwards to have disfigured the body in a shocking manner. The head being carried to Michael's tent, was afterwards sent to the family of Brulhe in the country of the Galla.

Michael, after this, married the widow of Mariam in the presence of all his army, with whom the measure was popular; but which sowed the seeds of a lasting jealousy between the emperor and himself. This was soon made public by a trifling accident. One day, while the army was on its march, Michael being much incommoded by the sun, threw a white handkerchief over his head to keep off the heat. This was instantly told the king, who took it as an affront offered to himself; for in Abyssinia it is forbidden to cover the head on any occasion whatever, in presence of the emperor, or even within sight of his palace. Joas, therefore, sent to the ras, to know upon what account he presumed to cover his head in his presence, and he even patronised an attempt to assassinate the ras. This issued in retaliating measures on the part of Michael, who succeeded in his object; assassins were despatched to murder the emperor; which they accomplished, and buried him in a church at Gondar, dedicated to St. Raphael.

Michael, now absolute master of Abyssinia, first proclaimed Hannes II. brother to king Bacuffa, emperor; an old man who had resided almost all his life on the mountain of Wechne, and had been deprived of one hand, to incapacitate him for the throne. He found him, however, entirely averse to taking the field, and is therefore said to have despatched him by poison, after which his son, Tecla Haimanout II. ascended the throne.

The young emperor, according to Mr. Bruce's account, was a prince of considerable accomplishments; and much attached, of course, to ras Michael, who now marched against the rebel Fasil without delay, and entirely defeated him on the 3rd of December, 1769. On this occasion Woosheka, another instigator of rebellion, was taken prisoner, and flead alive, his skin being afterwards formed into a bottle. This piece of cruelty was attributed to Ozoro Esther, the wife of Michael, whom Mr. Bruce, however, represents as the most humane and merciful of women. The night on which this miserable victim was destroyed, she appeared in the king's tent dressed like a bride; and in a little time returned in triumph to Gondar. During these transactions Mr. Bruce arrived in Abyssinia; and relates the history of the civil war after his arrival at great length; we need only add, that the emperor Tecla Haimanout kept his ground, and was finally acknowledged by almost the whole empire. Bruce had several interviews with ras Michael, who claimed on his part the honor of receiving frequent visits from the archangel of that name, and appears for years to have been stimulated to exertion by believing in this as a fact.

Mr. Bruce entered Ethiopia in September, 1769, and on the 19th arrived at Masuah, where there was a report of Hannes II. being ill. Mr. Bruce was supposed to be his physician; but, he was here ill treated by the naybe, with a design to extort money. He escaped from his power, however, by the protection of Achmet, nephew and heir apparent to the naybe; and by his own prudent and resolute behaviour. On the 15th of November, 1769, he left Arkeeko, and proceeded southward for Gondar, accompanied by two guides. In this journey he was told that he would be obliged to cross the mountain, Taranta, the highest in Abyssinia; but that the fatigue of this would be more than recompensed by the assurance of safety, and the curiosity of the place. After taking leave of Achmet in a very friendly manner, Mr. Bruce and his company set out on this part of their journey the evening of the 16th. For the short space they had travelled, the ground was covered with grass broader in the leaf than ours; but a little farther on, the soil was hard, dry, gravelly, and full of Egyptian thorn. Next day they changed their course from south to west, and soon arrived at a range of mountains standing so close to one another, that there was no passage be-

tween them, except what was worn by water. In the evening they pitched their tent at some distance from this channel, which had scarcely any water in it when they left it; but all the afternoon there had been an appearance of rain, with much thunder and lightning, at a distance. On a sudden they heard a noise among the mountains louder than thunder; and instantly saw the torrent, swelled immensely by the distant rains, now running like a rapid river, and the foremost part advancing in a body of water about the height of a man. Having dashed along for some time in this violent manner, the current, no longer supplied by the rains, began to diminish, and by the next morning was quite gone. Among these mountains the nights are cold even in summer. On the 18th, the journey was resumed in the bed of the torrent, which now scarcely had any water; though the stones were rendered very slippery by the quantity of rain which had fallen. Leaving this line of road, they came to a fine rivulet; which, being the first clear water they had seen from the time Mr. Bruce left Syria, was exceedingly welcome to our travellers. On the 20th of November they began to ascend the high mountain of TARANTA. See that article. Their road, excessively rugged and uneven, was every where intersected with monstrous gullies and holes made by the torrents, and by huge fragments of rocks. It was with the utmost difficulty that they could carry their astronomical instruments. Taranta is so destitute of earth, that there was no possibility of pitching a tent upon it; so that our travellers were obliged to take up their lodging in one of the caves with which it abounds. The air here was extremely cold, though the barometer was not below 59° in the evening. The road down the mountain was for some time equally rugged; but, as they approached Dixan, it became considerably better. The inhabitants of this place had been not long before exterminated by ras Michael; and their successors were, as Mr. Bruce says, composed of the vilest of the population from the territories of the Baharnagash and Tigré.

He was at first surrounded in a threatening manner by a body of armed men; but they were dispersed by the authority of Hagi Abdelcader, the friend of Achmet, who had received orders to provide for the safety of the travellers. The next stage was from Dixan to Adowa, capital of the province of Tigré. Leaving Dixan on the 25th of November, they pitched their tent the first night under a large spreading tree called daroo, which, Mr. Bruce says, was one of the finest he saw in Abyssinia, being about seven feet and a half in diameter. They had been joined by some Moors driving twenty loaded asses, and two bulls, which are likewise used as beasts of burden. They were now out of the dominions of the naybe, and entered into those of the emperor. Saloome, a guide of whom he had great suspicions, attended them for some way, and seemed disposed to proceed; but one of the company, who belonged to the Abyssinian monarch, having made a mark in the ground with his knife, told him, that if he proceeded one step further, he would bind him hand and foot, and leave him to be devoured by wild beasts. The mountains of Adowa, to which they came on the 5th of December, are all perpendicular rocks, and the town of that name, though the capital of an extensive province or kingdom, did not contain at this time above 300 houses. Mr. Bruce was very hospitably entertained here. Leaving on the 17th of December, he visited the ruins of Axum, where he found forty obelisks, without hieroglyphics, and about 600 houses. It is watered by a small stream which flows all the year, and is received into a fine basin 150 feet square. Its latitude was found by Mr. Bruce to be 14° 6′ 36″ north. On the 20th of January, 1770, our travellers left Axum. The road was at first smooth and pleasant, but afterwards very difficult; being composed of stones raised one above another, the remains of a magnificent causeway. As they passed farther on, however, the air was every where perfumed by a vast number of flowers, particularly jessamine. One species of this, named agam, was found in such plenty, that almost all the adjacent hills were covered by it, and the whole country had the most beautiful appearance. In this fine country, however, Mr. Bruce first beheld the horrible barbarity of cutting off pieces of flesh from the bodies of living animals, and devouring them raw. See ABYSSINIA. During the remaining part of the journey from Adowa to Sire, the country was equally beautiful, and the variety of flowers and trees greatly augmented; but, a report being propagated that ras Michael had been defeated by Fasil, the party now met with some insults. On the 22nd in the evening they arrived safely at Sire. The country northward of this place is flat and open. On the 26th of January, 1770, in their way to Gondar, between Sire and the mountains of Samen, they passed the river Tacazze, at a ford where it was 200 yards broad, and three feet deep; in lat. 13° 42′ 45″ After this they entered the country of Samen; the governor of which had never acknowledged the authority of ras Michael, nor that of the emperors set up by him since the death of Joas. It therefore was considered hostile to the reigning authorities in Abyssinia; but the uncertainty of the event of the war, and the well-known severity of Michael, protected the travellers from insult. In the road along the mountains of Samen lions and hyænas were numerous, and devoured one of the best mules Mr. Bruce had. The latter, he says, were not intimidated by the discharge of fire-arms, and their voracity was such, that they ate the bodies of their own species! On the 7th of February they began to ascend Lamalmon by a winding path scarcely two feet broad, on the brink of a frightful precipice, and frequently intersected by the beds of torrents, which produced vast irregular chasms in it. After an ascent of two hours, attended with incredible toil, they came to a small plain, named Kedus, or St. Michael, from a church of that name situated there. On the top of the mountain, which they reached on the 9th of February, the mercury in the barometer

stood at 20½ inches See LAMALMON. During the time our travellers remained at Lamalmon, a servant of ras Michael arrived to conduct them to the capital. As they approached the capital, the country appeared well cultivated, and they saw several plantations of sugar canes growing from the seed. They also were witnesses of the great damage done here by swarms of ants, rats, and mice. Mr. Bruce approached the capital dressed as a Moor; but the priests were alarmed at hearing of the approach of a Frank or European, thinking all Europeans Jesuits. He took up his residence in the Moorish part of Gondar, which was found to contain about 3000 houses, where he remained till the 15th of February, when an officer of the court, Ayto Aylo waited upon him, and addressed him in the character of a physician. By this nobleman he was carried to the palace, and introduced to the empress dowager, his advice being required for one of the imperial family, who was ill of the small-pox. Our limits do not allow us to give any particular account of the steps by which Mr. Bruce arrived at the high degree of reputation which he enjoyed in Abyssinia. They belong rather to his biography: but he clearly exercised great address, and rendered himself agreeable to all classes of the people of this divided country. By the court he was promoted to the government of Ras-el-Feel, and was the constant attendant of the emperor on several military expeditions. Thus honored and employed, he had an ample opportunity of exploring the sources and cataracts of the Nile, as well as the geography and natural products of the whole country; and the results, as detailed in his Travels, have been at last appreciated by his countrymen. He in particular amply describes the manners of the ABYSSINIANS: see that article.

We shall now present the reader with a brief sketch of the information respecting Ethiopia which has been furnished by subsequent travellers.

The indefatigable Burckhardt penetrated into Dan Mahass, a district of Nubia, as far as Tenareb, in about 20° N. lat. Very little has been added to our geographical knowledge of the space that separates Sennaar from the second cataract of the Nile, except what his researches, and the journey of Messrs. Waddington and Stanbury, supply. Immediately above this cataract the district commences, called Batn el Hadjar, which extends to about 21° N. lat: Sukkót is the name given to the next fifty miles; and after that comes Dar Mahass, which stretches about sixty miles from north to south. Dongola adjoins to Dar Mahass, which may be regarded as the termination of Nubia southward. It extends in a southerly direction up to a point a little below 18° N. lat., then bends to the east, always following the course of the Nile, and terminates where the great bend of that river forces the traveller, who traces its course upwards, to journey towards the north. Dar Sheygy'a is the name given to the district through which the Nile flows from north to south: and Berber and Shendy fill up the space between Dar Sheygy'a and Sennaar.

Burckhardt's researches were therefore confined to what is more properly termed NUBIA, and in that article we shall detail them.

Under cover of an expedition sent in 1825 by the pacha of Egypt, to conquer the Nile to its source, three travellers of different nations, Mr. Waddington, Mr. English, and M. Caillaud, penetrated far beyond Burckhardt's limits, and into districts as interesting as those which he visited. M. Caillaud, it seems, reached farthest of any, having followed the Egyptian expedition to the utmost point of its career, which terminated at Singué, in the tenth degree of latitude: but his voluminous travels are yet, we believe, in course of publication. Those of the two English gentlemen, and of Mr. English, an American, will now occupy our attention.

The whole of the districts we have enumerated exhibit, it is said, amidst a few minor diversities, considerable sameness of aspect. The Nile, as it flows through them, is divided from time to time into branches which afterwards reunite, so as to enclose in its waters many verdant isles and islets, which attract inhabitants both by the abundance of their productions, and by the security they afford against the depredations of the wandering tribes of the desert. Along one or both of the banks, and more frequently along the eastern than along the western, there generally extends a fertile and cultivated slip of ground, sometimes spreading, especially in Dóngola, to a considerable breadth; at other times very much compressed, or even entirely interrupted, by rocks and encroaching sands. To the right and to the left of this, all is dreary desolation, a wide expanse of sand frequented only by the predatory Arab, where the eye seeks in vain for any thing more cheering to rest upon, than the dark or yellowish tints of naked mountains in the back ground. The population of the Batn el Hadjar, Sukkót, Mahass, and Dóngola, is Nubian. The women are generally naked, except a covering round the waist; and do not appear to have made a favorable impression on Mr. Waddington, notwithstanding his prepossession in favor of black, which he thinks, or at least thought, the finest color for a human being. In speaking they use much gesticulation; when they mean to be emphatic, they sharpen their voice to shrillness: and, to enforce what has been said, the shrill sounds are re-echoed by the other females present, even though they should have taken no share in the previous conversation. They are not afraid of being seen in public. They ride and walk about uncovered, talk fearlessly to the men, return the salutations of strangers, and even salute them first Though in general very ugly, and, when old, almost hideous, they are so far from affecting the entire concealment of the person, which is usual with Mahommedan women, that the upper part of the body down to the loins is always quite naked. It is on the head that the labors of the toilet are chiefly bestowed. The hair is greased and plaited with great care: and, where superior pretensions to elegance exist, some of the plaits, passing under those which hang down by the side of the face, are brought backwards above the ears, exactly in the fashion which is often seen in the figures in the temples of Egypt.

The Nubian population is intermixed with Arabs. The Nubians have generally some knowledge of Arabic, but the Arabs are always completely ignorant of the Nubian tongue. Like the Egyptians they divide their year into three seasons of four months each; the Nile or inundation—the winter,—and the summer. The summer is the sickly season; and, at the end of it, in the middle of July, their year begins. Their buildings are generally of mud or straw. Those which are intended to serve as fortresses, are sometimes of brick, more frequently of mud. The larger dwelling houses, especially in places dignified with the name of towns, are also of mud—occasionally of mud and stones intermixed: but most of the inhabitants now, as in the time of Strabo, dwell in cottages of straw. These cottages are eight or ten feet in height; their walls are constructed of straw and palm-branches, kept together by strings made of the palm, and are fastened at each of the four corners to the dry stem of the palm; and the flat roof of palm leaves is secured and overtopped by acacia branches. In most of the villages is a hut by the road side, with a jar of water in it, for the accommodation of travellers.

Dar Sheygy'a, the most remote of the districts visited by Mr. Waddington and Mr. Hanbury (lying, as we have already stated, along that part of the Nile, where the river, before making a bend to the west, flows for nearly two degrees of latitude from north to south) is inhabited by the Sheygy'a Arabs. It appears to be subdivided into three states, often at war with one another, but ever ready to unite against a common foe. Adjacent to the Dóngolese frontier are the dominions of king or malek Zobeyr. Further up are those of malek Chowes, extending from Toraif to Kasinger; his capital is Merawe. Most remote of all is the kingdom of Amri, with its capital of the same name. It is a rocky, mountainous region, and has for its sovereign Hamet Wallad Asla. 'The Sheygy'a,' says Mr. Waddington, 'are black—a clear, glossy jet black, which appeared, to my then unprejudiced eyes, to be the finest color that could be selected for a human being. They are distinguished in every respect from Negroes, by the brightness of their color, by their hair, and the regularity of their features; by the mild and dewy lustre of their eyes, and by the softness of their touch, in which last respect they yield not to Europeans.

This is a brave and warlike race, and have long been the most powerful people between Egypt and Sennaar. They live on horseback, with arms constantly in their hands. Their horses, which are of the Dóngola breed, are taught to swim across the Nile in the broadest parts, and trained to a gallop resembling the spring of the antelope, which, though it occasions no embarrassment or impediment to riders accustomed to it, renders it extremely difficult for a foe to take a sure aim at them.

When equipped for war, they have each two lances and a long solingen sword. A few have pistols, but the possession of guns is confined to their chiefs. Their defensive armour consists of an oblong shield made of the skin of the crocodile, or more frequently of that of the hippopotamus. Some of the leaders wear a coat of mail, which covers the head, and falls down over the shoulders to the middle of the back, strong enough to resist a spear, but penetrable by ball. They are singularly fearless in an attack. Riding up with gaiety of heart to the very face of their enemy, as to a scene of festive enjoyment, they give the salam aleikoum—Peace be with you; and the deadly thrust of the lance instantly follows the mock salutation of friendship. Their warlike character does not hinder them from cultivating the ground. They raise considerable quantities of wheat and dhourra, and carry on traffic with Darfour and Sennaar. They have many Nubians settled in the country; and, when their own numbers have been exceedingly diminished in war, they have supplied the loss by carrying off Dóngolese. These Nubians, though regarded as inferiors, do not seem to be reduced to servitude; but a great part of the labors of agriculture devolve upon them.

The whole of Dóngola was formerly under the dominion of the Sheygy'a: Dar Mahass was subject to their frequent, Sukkit and the Batn el Hadjar, to their occasional inroads. Till the arrival of the Mamelukes, Handec (situated between New and Old Dóngola) was the ordinary residence of malek Chowes: and the rest of Dóngola was parcelled out among their chieftains, who appropriated to themselves one half of the taxes paid by the people, and left the other half to the native princes. But the arrival of the Mamelukes in 1812 altered this situation of things. When these exiled warriors under the command of the beys Ibrahim and Roehman, made their appearance in Dar Mahass, the Casheef of that district was at war with the Sheygy'a, who were settled in the southern part of Dóngola. At his solicitation the Mamelukes advanced to the isle of Argo: but the war, which they threatened, was suddenly changed into peace. They were entertained at Argo as friends and allies, and they rewarded the confidence reposed in them, by a treacherous massacre of their hosts. The Sheygy'a immediately sought to avenge in war their murdered brethren; but they were soon forced to cede to the strangers the western bank and the islands of the Nile, from the frontier of Dar Mahass as far as Hanneeh. The Mamelukes now acted as rulers of the country, and as intending to make it their permanent abode. They dismissed their Egyptian wives, and married the daughters of their Nubian subjects. They increased the taxes to one-third of the whole produce; they promoted the cultivation of wheat instead of dhourra; they introduced some of the more ordinary arts; and having fixed the seat of their government at Maragga, which now assumed the name of New Dóngola, they enlarged and improved it. Zobeyr, one of the Sheygy'a chiefs, begged their assistance against his neighbour malek Chowes. They complied with his request: and with some of their own forces, zealously seconded, it would appear, by their Nubian vassals, they were again successful against their Sheygy'a foes. But the vengeance and ambition of the pacha of Egypt still pursued them. Mohammed Ali, eager to annihilate the remnant of his once formidable

enemies, and anxious at the same time to carry his conquests to the borders of Abyssinia, began in 1820 to assemble the army which was to penetrate into the countries beyond the second cataract. While the preparations were going on, he sent a messenger to New Dóngola, in the hope that flattering promises might reduce the Mamelukes to subjection. Their only answer was an expression of indignant contempt.—'Tell Mohammed Ali that we will be on no terms with our servant.' Hearing of the approach of his army, they celebrated the Ramadan with unusual solemnity, and in the middle of June, mustering about 300 strong (they had lost about 100 men, and among them Ibrahim Bey, during their residence in Dóngola), with double that number of women and slaves, they took their departure for Shendy.

The army which the pacha had collected against them was nominally 10,000 strong, and was accompanied by twelve pieces of artillery: the number of fighting men in it, however, did not exceed 4000. The command was entrusted to his second son, Ismael—a bold and impetuous youth, twenty-two years of age, who gave considerable promise of being one day a superior character. Under him were several leaders of more advanced age and more mature experience, among whom Abdin Casheff was the first in character and influence. The troops were all mercenaries; the best of them were Bedouins and Moggrebbyns. Their engagement bound them to serve only as far as Dóngola, and they received six months' pay in advance. Leaving Cairo early in the summer, they passed the cataracts during the inundation, arrived at New Dóngola without opposition, and, having agreed to extend their services as far as Sennaar, advanced against the Sheygy'a. Such was the situation of this little-known part of Ethiopia, when Mr. Waddington and Mr. Hanbury resolved to avail themselves of the facilities afforded by the progress of the victorious army to penetrate where none of their countrymen had been before.

Four days, and part of the fifth, were spent by these gentlemen in traversing the Batn el Hadjar. They kept the right bank of the Nile; and their course was through a plain, except where the rocks, that skirted it on the left, approached so near to the river as to make it necessary for them to wind through the mountainous passes. Some of these passes were not destitute of beauty. The Virgin's Pass, in particular, struck Mr. Waddington. 'The rocks,' says he, 'are high and well broken, and often joined by sand blown up to a great height between them. The sun-set was red and fiery, the moon clouded, and the sky unusually disturbed; a strong, though mild, wind served to increase our enjoyment of the most English evening we had seen in the East.' They saw many fertile spots, that lay altogether uncultivated. The villages were of mud, and a few old Christian churches were still to be seen. The Nile, from time to time interrupted by rocks in its course, exhibited a great variety of cataract scenery. The people appeared stupid. One man, to whom they applied for information, answered their questions by saying, that his father had not taught him any thing about hours, and that he was not acquainted with any division of time.

On the 15th, Messrs. Waddington and Hanbury entered Sukkót, and slept at a village called Ferket, where, according to the promises of the Aga of the Cataracts, the camels were to be replaced by others. In the morning, they found that no camels could be procured: and they were deliberating on the propriety of pressing into their service two of those which had brought them thither, when they were informed, that the drivers, apprehensive probably of some such measure, had during the night set out with their beasts for Wady Halfa. The party were therefore obliged to have recourse to the assistance of asses. After two hours' travelling, during which they seem to have had much difficulty in keeping their asses together, and still more in getting them to move onwards, they came to Mograte. 'Here,' says Mr. Waddington, 'our prospects brighten a little; a camel is discovered among the palms, and soon afterwards another, and a man, with a woman and child near it; he proves to be an Ababde Arab, named Achmet, going down, with his wife and infant, to buy dates; we of course invite him very warmly to enter into our service, to which he as strongly objects; and, on being more urgently pressed, he asks with great feeling, 'And will you oblige me to leave my wife and child in the hands of strangers?' Now his wife was a very pretty woman, and was watching this scene with great interest, though in silence. The case was certainly a hard one, and perhaps we were decided by the sight of one of our asses, at that moment down on the ground, struggling with his burden: however, we were decided; we justified ourselves by the tyrant's plea, and immediately proceeded to transfer part of our property to the more dignified situation it was once more destined to occupy. The man entrusted his family to a fellow countryman, an inhabitant of the village, and proceeded reluctantly with us.'

The Arabs, who were forced into the service of the travellers, demanded half a dollar per day for each camel; this charge, which was much less than that of the Aga of the cataracts, was willingly paid. Beasts of burden were not the only things which there was a difficulty in procuring. Provisions were often scarce. The sour bread and milk of the country were supplied willingly; but the inhabitants frequently refused to give or sell better fare—probably because they had not enough for their own wants, and those of the Turkish officers and agents who were constantly passing and repassing between Cairo and the seat of war. When this happened, 'the tyrant's plea' was enforced anew. Fowls were generally abundant; our countrymen shot as many as they thought they should need, and then paid for them: for the owners, who would not sell their live poultry, had no objection to part with them when once they were dead. At a later period of their expedition, when they were passengers in one of the boats that were proceeding with supplies to the army, a similar transaction came under the cognizance of the commodore. They had seized a fine fowl in a Nubian cottage, and then paid for it. 'But as a previous refusal to sell,' says Mr. W., 'and subsequent

payment on our part were proved, the commodore gave his approbation to this modification of a robbery.'

The inhabitants of Sukkót seemed glad that the pacha had taken the country into his own hands; for his sovereignty was a protection to them, both against the depredations of the Arabs, and against the rapacity of their own petty chieftains, who had been in the habit of leaving their subjects just enough to tempt the rovers of the desert. They gave our travellers, for the most part, a kindly reception. Their admiration was excited by their arms more than by any thing else. 'Now, at last,' exclaimed one of their sheiks at the sight of a sword-stick, 'now at last we begin to see the world.' The face of the country was superior to that of the Batn el Hadjar. The Nile was less interrupted by rocks; the plain had assumed a wider extent; the acacias were finer than even in Egypt; but the many ruined houses, which were to be seen, attested too surely that the population was in unprosperous state.

The travellers entered Dar Mahass on the 18th, and spent three days in traversing it. The general aspect of this district was similar to that of Sukkót; if there was any difference, it was on the side of improvement. The soil was better cultivated; matted work was becoming plentiful; and great numbers were seen employed in weaving. Shortly before quitting Dar Mahass, our travellers enjoyed the contemplation of the most striking spot that Nubian scenery has to boast of. It is known by the name of 'the Pass of the Water's Mouth.' Near the entrance, on the right, two immense stones, regular as if art had hewn and placed them there, stand detached in solitary grandeur. Beyond them the pass opens with extraordinary sublimity: and the traveller finds himself amid a wilderness of rocks, that tower aloft like so many natural columns. In the presence of these enormous masses, irregularly scattered about in solitude, 'we felt ourselves,' says Mr. W., 'in a holy place, and seemed walking amid the columns of a mighty temple, erected by the divinity in his own honor, and for his own worship.' 'There is nothing at Assouan, Wady Halfa, or in the Batn el Hadjar, at all comparable to the 'Pass of the Water's Mouth,' either in grandeur or in variety of scenery: the immense masses of rock piled up together, the open plains scattered over with fragments, the entire want of all vegetation, and yet the traces of so many animals; the occasional view of the distant palms straggling by the river side, and of the boundless desert beyond it, with the knowledge that man has no power here to change the face of nature, which ever has been, and ever must be what it is; these circumstances unite to give this place an interest possessed by no other that I ever saw, and to us, perhaps, heightened by the reflection, that we were the first Englishmen who had ever seen it, as we might possibly be the last.'

On the morning of the 22d of November, they entered Dóngola. Five palms standing by the river side, and a large solitary hill, Mount Arambo by name, four miles distant from the Nile, mark the frontier. About a mile beyond it, they observed two hieroglyphical inscriptions on a large granite rock, called by the natives the Golden Stone. One of them faces the north-west, and is two feet four inches broad, and three feet high. A man, with his hair in the fashion of the Briareus of the Egyptian temple, is in the act of making an offering; and, in the lower corner on the left, are two prisoners, back to back, with their arms chained together. The whole is encompassed and diversified with hieroglyphics. The other faces the south-west, and consists of eighteen lines of hieroglyphics, with the ball and serpent at the top; but it is so defaced that no copy of it could be made. On the same day they saw much cotton growing in the neighbourhood of a place called Askán, and passed what we certainly did not expect to find in Dóngola—a cotton-mill.

On the following day, their route lay at first through a barren plain, the uniformity of which was broken only by a few acacias, and many ruined houses and tombs: but crossing a high mound, which was between them and the river, they suddenly found themselves in a garden luxuriant beyond imagination, where the air breathed fragrance, and the groves were filled with melody. Dismissing here their guides, and beasts of burden, they were ferried over into the island of Argo. The scenery of the island is very beautiful; consisting of meadows, where cows and goats feed without any keeper, intermixed with small open cultivated fields, all shut in by sycamore and aromatic groves. It is likewise interesting to the antiquary, by the ruins of ancient buildings and fragments of ancient statues which it contains. Our countrymen traversed it nearly from north to south, and arrived at the ferry for crossing to the western bank of the Nile, elevated by the hope that a few hours would bring them to New Dóngola, where abdin Casheff would lend them every assistance for the further prosecution of their journey. From the ferryman, however, they learned that Abdin Casheff had advanced to join the army; intelligence which could not be very acceptable to travellers, who, counting upon his protection, were without camels, and almost without money. With the assistance of asses, they arrived on the 25th at New Dóngola, which we have already mentioned as having been the capital of the Mamelukes, and greatly improved by them. It is a large and very neat mud town, ornamented with courts and squares, and beautifully situated in the finest country of the Nile. It lies in 19° N. lat. The river is here about half a mile broad.

As no beasts of burden could be procured, to proceed by land was impossible. In this dilemma, the travellers applied to the Turkish Aga, to grant them a passage in one of sixteen boats, which were about to sail with supplies for the army. Their request was instantly granted: and, on the morning of the 26th, they commenced their voyage up the river. This mode of travelling did not allow them any opportunity of examining the country, but it gave them some illustrations of Turkish discipline and Turkish navigation. The former is somewhat better, the latter much worse, than we had imagined. The boats could not move unless the wind was directly favorable:

and they scarcely dreamt of the possibility of crossing the river with a side breeze. So much for their navigation. As to their discipline, all plundering was prohibited, and the troops were not permitted to oppress the natives. One morning Mr. Waddington found the commodore in great wrath, and beating all the soldiers who came within his reach, because during the night some of them had plucked the ears of the dhourra. This severity of discipline, however, was neither maintained uniformly, nor was it universal in its operation. Some restraint was imposed upon the troops, only that the superior officers might have a more complete monopoly of rapine; and, though the soldiers might not steal a few ears of corn, they were at liberty to seize the sheep of the inhabitants by force, and pay for them in base money, which had neither currency nor value in the country. Accordingly the neighbourhood of the fleet seems to have been dreaded by the natives. The want of a favorable wind forced the commodore to make a halt near the town of Amboocote, and, in the course of the ensuing night, the inhabitants removed with their property into the desert. During this delay our countrymen received a visit of an uncommon description. It was from some Cubbabish Arabs, who, in the character of strolling preachers, went about the villages, teaching and explaining the Koran, in churches set apart for that purpose. They said that nearly all their tribe could read and write; so that, if reading and writing are to be taken as the criteria of education, the county of Middlesex, we are afraid, must yield the palm to a horde of Nubian Arabs. They supposed that Mr. Waddington was invested with authority to assess the new impositions upon the country (an error arising probably from the frequent use he made of his pencil in noting the names of places and the incidents of his journey), and they came to ascertain the rate and manner in which they were to be taxed for the future, and to entreat him not to make their burdens too heavy.

On the 7th of December the fleet resumed its progress, and, leaving Dóngola, entered Dar Sheygy'a. Our travellers were now in the theatre of the war, and they found that the arms of the Turks had been hitherto successful. Ismael pacha, having upon his approach to the frontier summoned the Sheygy'a to submit, was answered by an offer to pay tribute. He next required them to prove their sincerity by sending him their arms and their horses, but received the same reply. And when he renewed his demand, 'Either go on your business, or come and attack us,' was the laconic answer made to it. In the first skirmish the Sheygy'a were the assailants, and were repulsed. In the second they were again unsuccessful, and the virgin daughter of one of their chiefs was made prisoner. The pacha sent her back uninjured and loaded with presents: and her father showed his gratitude to his generous enemy by refusing to take any further share in the war. To diffuse astonishment and terror among them, Ismael caused a brilliant display of fire-works to be made in view of their encampment. 'What!' said they, upon beholding the exhibition, 'is he come to make war upon heaven too.' They were told by some of the Arabian followers of the pacha, that, unless they submitted, he would drive them to Sennaar; they replied, 'He may drive us to the gates of the world, but we will not submit.' An engagement, of more importance than any which had preceded it, took place shortly after Mr. Waddington's arrival in the camp. 'Their first attack was irresistible; the Bedouins were driven back, and Abdin Casheff advanced from the opposite angle of the square to support them; while he was engaged, the Bedouins rallied in his rear, he returned to his post, and they charged again. The Moggrebbyns had been similarly routed and rallied. The Sheygy'a, though suffering very severely, repeated their attacks, and three times was Abdin Casheff seen to charge in person, and throw himself into the middle of the enemy; he shot several of them with his own hand, and, having disarmed one, he drove his own lance quite through his body. The pacha was giving, in other parts, similar proofs of courage, the only one he could now give of generalship, and the pistol of his Highness is said to have been particularly destructive; he caught the gaiety of his enemies, and rode among them with a laugh. At last, the Sheygy'a, finding that their magic had not been able to stop the course of Turkish balls, and that the charms of the enemy were stronger than their own, said, 'that God had declared against them,' and took to flight. They had placed great dependence on those charms to which their necromancers had given, for this occasion, peculiar power and efficacy; and their first act after the battle was to put to death the whole race that had thus imposed on their credulity.

'Their cavalry, being much better mounted than their adversaries, in general escaped, but a great part of the infantry was massacred. It is, however, universally acknowledged that the pacha exerted himself to save the flying enemy, and succeeded in preserving some, who were of the infantry, and chiefly Nubians: inhabitants of that part of Dóngola which was tributary to the Sheygy'a, and attached to their army by force, or habit, or inclination; for these Arabs were not disliked by their subjects. The pacha made presents to his prisoners, and clothed them, and sent them back to the Sheygy'a with an insulting message, not to send Berabéres against them, but to come themselves; to which they answered, as when yet unwounded, 'Either go on your business, or come and attack us.' He had not yet passed their mountain barrier, where they had been in the habit of routing their invaders.

'It is a singular, though very certain, fact, that the pacha had not one man killed in this action, and only one officer and sixteen men wounded, and these, with scarcely any exception in the back—the natural consequence of their manner of fighting; they discharge all their firearms, and then retire into the rear to re-load, while the second and succeeding ranks are firing; when loaded, they advance again, and therefore, after the first discharge, the whole is a scene of confusion. One Bedouin received seven lance wounds, not one of which was honorable, and

recovered of them all; he had been unhorsed among the enemy, and lanced while lying on the ground. 'The Sheygy'a left 600 men on the field of battle. I have heard of some acts of individual courage performed by them during the battle, and which are related with admiration by the Turks themselves. One Arab, who appears to have placed perfect confidence in the strength of his charms, after receiving five balls, continued fighting, and crying out, 'that they might fire, but could never hurt him;' till he received his mortal wound. The exploits of another are particularly celebrated by his enemies, who, after being similarly perforated, fought till he fell, and died crying 'Where is the pacha?' Another, also wounded, had lost his horse; however, he found his way to the door of the tent of Selagh Dar, whose groom was standing there bitting his master's charger; the Arab disabled the groom, leaped on the horse, and galloped away.' (P. 92—102). Those who escaped from the battle took refuge in some stone castles situated on the western bank of the Nile, in the neighbourhood of Mount Dager; and soon afterwards, in formidable battle array on the side of the hill, they again defied the invader. A heavy fire of shot and shells soon dispersed them, rather dismayed by their superstitious alarms than terrified by the carnage. The shells appeared to them to work by sorcery. 'The spirits of hell are come against us,' was the exclamation called forth by the explosion of a shell, which had fallen among them.

The melancholy effects of the war were visible on both sides of the river. The villages were burnt down or deserted; the dogs were their only inhabitants. In one of them some mats and bedsteads remained; and over the doors were inscriptions written on paper in a very legible hand, purporting 'that the inhabitants had been driven away by unholy people, not under the protection of God.' In another village, one old woman was still lingering, who had refused to quit her cottage: she rejected all sustenance, and talked lightly of death. A multitude of women, who had fallen into the power of the invaders, were confined in one of the islands of the Nile. Mr. Waddington's servant asked some of them, whether they were not afraid of the soldiers. The reply breathed a spirit of magnanimity, scarcely inferior to that which true religion would inspire: 'Why should we fear the soldiers? Can they do more than kill us?' In another village, an old woman was the only living creature in it, and she had her ears cut off; for Ismael, that he might send down a large collection of ears to his father as proofs of his success, bought them at fifty piasters a piece: and this necessarily led to much wanton cruelty. The shore was putrid, and the air tainted by the carcases of oxen, goats, sheep, camels, and men. Corpses were found every fifty yards scattered along the road, and among the corn. The horror of such objects formed a strong contrast to the placid beauty of the scenery. 'I never,' says Mr. Waddington, 'saw the Nile so smooth and beautiful as in this country; it is like a succession of lakes ornamented by green islands, and surrounded by verdure. This may be fancy, and that the mind, disgusted by the fury of men, takes refuge in the tranquillity of nature, and is more disposed to the admiration of inanimate things, as it is shocked by the crimes and miseries of the things that live.'

On the 13th of December Mr. Waddington and his party quitted the boat which had brought them from New Dóngola, and proceeded along the eastern bank on dromedaries which the pacha's physician had sent to meet them. They passed through a town, named Kadjeba, entirely deserted by its inhabitants; and, in the course of the day, they met many families, consisting of old men, women, and children, who, with the pacha's permission, were returning to their villages. The travellers were now in the dominions of Maleck Chowes, whose capital, Merawe, they reached, when it was nearly dark. They did not halt there; but passing through its long and gloomy streets, where the howling of dogs was the only sound that met their ears, they arrived in the camp of Ismael. A mud cottage had been prepared for them, in which they were received by the pacha's physician with every civility.

On the following afternoon they were presented to the pacha, from whom they met with the most gracious reception. He made them sit by him on his sofa, and requested them to accommodate themselves in the fashion of their own country. He seemed to have a tolerable acquaintance with the geography of Europe, and put many questions and showed great curiosity concerning European politics. He was much surprised that the English did not assist Ali Pacha, for whose success he was anxious; and still more, that the Congress should have allowed the force of Russia to be increased.

No military operations took place after their arrival in the camp. The Turks and the Sheygy'a, were in constant negociation; and Ismael appears to have let slip no opportunity of conciliating his adversaries. These negociations terminated finally in peace. The Sheygy'a, who from the beginning had offered to pay tribute, became the allies of the pacha, retaining their arms and their horses; and it was agreed that a number of them should advance with his army against the southern nations, who were their enemies as well as his. Our travellers were prevented from witnessing this event, and from accompanying the army in its advance, by finding their departure most unexpectedly precipitated.

On the morning of the 20th of December, when they had not been quite a week in the camp, they were informed by a message from the pacha, that he meant to dismiss them with all honor on the following evening. On the same day they had an interview with him. 'We found him sitting in the European manner, on a very Christian-like sofa, on which we took our places by him. Nothing could be more gracious; the doctor, as usual, stood before us to interpret, and James within hearing, a little behind. On a carpet on the pacha's right hand was a grand Turk from Cairo, and next to him two sheygy'a professors with long white beards, who had just been clothed, to their very great surprise and dismay, in splendid pelisses and rich shawls.

'The usual preliminary conversation about

the river, the mountains, and the trees, we cut rather short, and came somewhat hastily to the point. 'We are come according to the commands of your highness, supposing that your highness has something particular to communicate.' 'I feel honored by your visit to the army, and should be pleased to have your company as far as Sennaar, but the dangers and difficulties and privations will be so great, that I advise you to return.' 'We wish respectfully to be informed, whether your highness's advice amounts to a command?' 'It is for your own good, and the love I have for England.' 'We are to understand, then, that your highness obliges us to return?' 'It is solely with a view to your own good that I give this order.' 'We are sorry that your highness has thought proper to prevent the intentions of English gentlemen. We submit to your highness's order.' 'My only motive is a consideration of your own safety; besides which, the firman given you by my father extends no farther than Wady Halfa.' 'We do not dispute your highness's right to act, but rather thank your highness that we have been allowed to come thus far, and perhaps we should not have thought of advancing farther, had not the Protomedico communicated to us, from your highness, an invitation to accompany the army as far as Sennaar.' 'I should have great pleasure, were it not that I fear for your safety.' 'Well, we submit; we have only to beg your highness to permit us to advance as far as the cataract and the islands near it, and then to return by water.' 'The danger is not so much in advancing as for your return, as the people in our rear are even now unquiet, and, when the army moves on, will probably break into insurrection; and from above I shall not be able to send a guard with you; nor will it be safe for you to go by water. As visitors to my army, I am responsible to my father, and to the English nation, for your safety.' 'In case of our writing to Cairo to mention the offers of protection made by your highness, may we be allowed these favors, by taking all responsibility on ourselves?' After some hesitation, 'If you will write a letter to such effect, and give it to me, I will send it to my father and the English consul, and you are then free to advance or return, as you like.' And after a few more words, in which he promised us a boat to go down in, the matter was ended greatly to our satisfaction.

'He attempted, during the latter part of the conversation, which is here much abridged, to work alternately on our vanity and our fears; on the former, by a number of unmeaning compliments to ourselves and to the English nation; and on the latter, by accounts of robberies committed every night in the very rear of his army, and the general disturbed state of the country; and then he motioned away the Mamelukes and Janissaries, who were standing by, as if he were making us an important communication, that would spread a panic in his army if generally known. The courtier from Cairo gave us from time to time some looks of mixed anger and surprise, on observing perhaps a freedom in our words or manner that was not usual towards a Turkish prince. The pacha ended by telling us, that he would defer the departure of the convoy till to-morrow evening, to give us more time for reflection, and we parted apparently good friends.' (p. 149—151). They immediately wrote a letter, taking upon themselves exclusively, in the strongest language they could use, all responsibility for their own safety.

But the pacha, though he expressed himself perfectly satisfied with it, begged them to reconsider the subject: and Abdin Casheff, having sent for them, entered into many details to prove, that their advance would be dangerous, and their return, after a certain time, impossible. They now, therefore, saw that the pacha was determined they should go no further. The promise of a boat to convey them down was retracted, and it was fixed, that they should return with a convoy along the left bank of the Nile. The escort, however, was placed completely at their disposal, and every necessary for the journey liberally supplied. A respite of two days was also allowed them, that they might finish their plans and descriptions of the antiquities in the neighbourhood.

These two days our travellers assiduously devoted to the important ruins a little to the north of Merawe, at the foot of the mountain Djebel el Berkel, near the site, as Mr. Waddington supposes, of the ancient Napata. They consist of temples and pyramids. Of the seven or eight stone buildings and excavations in the rock, which Mr. Waddington supposes to have been temples, there is one which far exceeds all the rest. Including the thickness of the walls, it is 450 feet long, and 159 wide: its entrance faces the Nile, and, going in, you pass successively through five chambers, the exterior being larger than the interior, and all of them having been once ornamented with columns. To the left of the innermost chamber but one, is a sixth apartment; and in each of these two is a black granite pedestal, beautifully sculptured, on which stood, most probably, the statue of the god to whom the temple was dedicated, or of the king by whom it was erected. Hieroglyphics were still visible on the ruined walls. From having observed a sculptured stone among the mortar, in the middle of the thick outer wall, Mr. Waddington inferred that the stones were taken from some more ancient edifice; and the irregularity of the foundations, together with the positions of several of the columns, inclined him to believe that this building had, when erected, included within it some chambers of one still older. The most perfect of these temples is one which, according to Mr. Waddington, was dedicated to Bacchus; it is about 100 feet in length, and is ornamented with figures of nearly all the gods of Egypt. The following is the description of the edifice, which, in his opinion, surpasses all the rest in antiquity:—

'Five of its six chambers are cut in the rock, and the other, the first, which is thirty-six feet square, stands on an artificial stone foundation, by which it is elevated to the height of the rock in which the others are excavated. The wall separating the second chamber from the first is solid, but of no great thickness; the chamber measures twenty feet five inches by twenty-one feet six inches, and contains the remains of four round pillars, whose diameter is two feet five

inches. The third chamber is only ten feet nine inches in length, and of nearly the same width as the second. The fourth, or adytum, is twelve feet four inches long, and ten feet eight inches wide. Of the two smaller ones, on each side of it, the one is four feet three inches in width, and the other only three feet nine inches: at the end of each is a stone bench, two feet in height, where statues may formerly have been erected. The height of the solid roof, which is now in most places fallen in, was eleven feet seven inches. On the back wall of the room, on the right of the adytum, appear two defaced figures of Jupiter Ammon, and the young divinity whom I have called Horus. There are vestiges of hieroglyphics in all the chambers. Above the rock, which forms the back wall of the adytum, are six or eight layers of stones, of different sizes, and of the rudest architecture, erected possibly as a defence against fragments which might roll down upon the temple from the mountain behind. The walls of the cells have in two or three places been repaired, and faced with stone, on which are hieroglyphics. There are some specimens of the same kind of patchwork on the front of the rock, in which the temple of Gyrshe, in Nubia, is excavated. The elevated chamber in front may have been the addition of a later age; as in the preceding temple the statue of Bacchus, and the capital or ornament on its head, are better executed and finished than the figures sculptured on the walls within. From the simplicity of the masonry, from the rudeness and decay of the remaining sculptures, and from the raggedness and decomposition of the walls, though they had been sheltered probably for ages, by the solid rock, from the sun and wind, I am inclined to believe that this is older than any of the temples of Egypt, or even Nubia. We observed nowhere any sculptures that had been intentionally erased or disfigured; proving, I think, that the ruins were in their present state when Christianity was introduced into the country. The idols were already broken, and the ravages of time, or of war, had been so effectual, that they needed not the hand of fanaticism to complete them.' (p. 169—171).

The pyramids of Djebel el Berkel are on the north and north-west of the mountain, near the edge of the desert. They are seventeen in number, but some of them are now mere shapeless mounds. None of them are of considerable size: the base of the largest is eighty-one feet square. One group, consisting of seven, have all, with one exception, arched porticoes annexed to them, coeval, as it appeared, with the pyramids themselves.

At El Bellál, a rocky spot surrounded by sand, on the edge of the desert, six or seven miles above Djebel el Berkel, and situate on the left bank of the river, the remains may be seen of nearly forty pyramids of different sizes, of higher apparent antiquity than those of Djebel el Berkel, and in a more ruinous state than the most ruinous of those at Saccara. Mud seems to have been the cement employed in them. The greater part of them are now mere mounds of decomposed stone, gravel, and sand. Even in those which have best withstood the ravages of time, the exterior coating has crumbled off, and the layers to some depth within have fallen away. The largest has a base of 152 feet square, and is 103 feet seven inches in height: it contains within it another pyramid of a different age and architecture, and composed of a hard, light, colored sand-stone, 'more durable,' says Mr. Waddington, 'than that, which, after sheltering it for ages, has at last decayed and fallen off, and left it once more exposed to the eyes of men.' The conclusion is too hasty. The outer case has been exposed to the winds and rains of thousands of years, while the inner pyramid has been completely sheltered: the less ruinous state of the latter is therefore no proof of the superior durability of its materials. They were informed that, in the island of Doulga, situated a short way up the river, immediately above a cataract, there were large excavations and 'buildings that reached to heaven.' These they supposed to have been fortifications, not temples; and that Doulga is the island in which the king of Dóngola took refuge in 688 from the pursuit of the boats and troops of the sultan of Egypt.

Mr. English's account of the country on each side of the river up to the pyramids of Merawé, where the voyage of Messrs. Waddington and Hanbury terminated, is pretty nearly the same as that of those gentlemen, though, on the whole, rather more favorable, both as it regards the people and the state of the cultivation. He praises the forbearance of the Turkish troops, though frequently reduced to the greatest distress for want of provisions. The only complaint he makes of taking by force the property of the wretched inhabitants, is directed against the Greek and Frank domestics of the protomedico, 'who seized whatever they thought they had occasion for.' The pacha soon put a stop to irregularities of this kind—'The most rigid discipline was observed in the camp, to prevent the people of the country from suffering by the presence of the army. Some soldiers and domestics were severely beaten for taking sheep and goats without paying for them, and five of the ababdies (auxiliaries mounted on dromedaries) were impaled for having seized some camels from the peasants.'

Nothing, he says, could exceed the fertility of the country beyond the second cataract. The banks and islands presented one continued succession of villages amidst fields of grain, interspersed with stately palm trees, acacias, and sycamores, larger and taller than those of Egypt; and the fine broad river, swollen out in many places to the width of two or three miles, and studded with numerous fertile islands, conveyed to the eye a far more picturesque appearance than is observed in any part of the Said. This description applies more particularly to the territory of Succoot; the next beyond it, which is Mahass, though generally fertile, is inferior to the former. But of Dóngola, he says, 'the whole country is absolutely overwhelmed with the products of the very rich soil of which it consists.'

Yet the pacha's flotilla that conveyed his army, ammunition, and provisions, navigated the Nile beyond the second cataract without a rival. A constant intercourse however is kept up between the islands and the shores of the main land.

This is done either by swimming their horses and cattle, or by floating on bundles of reeds, straw, or pieces of wood, buoyed up with gourds, in the most clumsy and awkward manner. 'I saw to-day,' says Mr. English, 'a singular mode of navigating the river; a man, who apparently was travelling down the river with his whole family, had placed his youngest wife and her two young children on a raft made of bundles of corn-stalks (stems of the holcus) lashed together; he himself swam by its side to guide it, while he kept his old wife a-swimming and pushing it by the stern; and in this way they proceeded down the river.'

Our American only joined the encampment of the pacha about the same time and at the same spot where Messrs. Waddington and Hanbury had their short interview, and their dismissal. He only therefore knew from hearsay what took place at the great battle in the vicinity, which decided the fate of the Sheygy'a and the Mamelukes, and opened a free passage to Sennaar. He relates, though somewhat differently, the anecdote of several travellers, respecting the young pacha's treatment of the daughter of a chief who fell into his possession, and whose conduct is scarcely surpassed by that of Scipio. 'When our troops approached the castle of Malek Zibarra, his daughter, a girl of about fifteen, fled in such haste that she dropped one of her sandals, which I have seen. It was a piece of workmanship as well wrought as any thing of the kind could be even in Europe. The girl was taken prisoner and brought to the pacha, who clothed her magnificently in the Turkish fashion, and sent her to her father, desiring her to tell him to 'come and surrender himself, as he preferred to have brave men for his friends than for his enemies.' When the girl arrived at the camp of Zibarra, the first question her father asked her was, 'My child, in approaching your father, do you bring your honor with [illegible] 'Yes,' replied the girl, 'otherwise I should not dare to look upon you. The pacha has treated me as his child, has clothed me as you see, and desires that you would leave war to make peace with him.' Zibarra was greatly affected, and did make several efforts to effect a peace with the pacha, which were traversed and frustrated by the other chiefs of the Sheygy'a.' p. 86.

Mr. English did not follow the great bend of the Nile above Dóngola, which, he says, is 250 miles long, and full of rocks and rapids, but crossed the peninsula in a direct line towards Shendi. He was now in the country of the Berbers, whom he is not much in love with, and whom he describes to be as licentious as the lamented Mr. Burckhardt found them, especially the women, who walk about the streets and roads unveiled, without the least embarrassment. In appearance the common people are not unlike the fellahs of Egypt; but the families of the maleks or chiefs are generally as stout and tall as they were in the days of Cambyses. The malek with whom our traveller lodged was seven feet high; his youngest son, six feet four inches, stout and well proportioned. The mother, he says, offered him the choice of two of the daughters, both young and handsome, and both married to husbands living in the town; but he declined the proffered favor, which did not raise him very high in the esteem of the ladies.

The country of the Berbers is fertile, and the cultivated lands extend to the distance of a couple of miles from the river; thus far the inundations reach. The produce is abundant, consisting of dhurra, wheat, barley, beans, cotton, tobacco, and various culinary vegetables. The horned cattle are large, the sheep, goats, camels, and asses, are also of a large stature, and the horses, as we have said, unequalled. The houses are generally of clay, with flat roofs, covered with straw, which would seem to prove that the rains are neither frequent nor heavy; the roofs of the houses belonging to the meks, or maleks, are terraced with beaten clay. The place particularly to which these remarks refer is called by our author Nourreddin, after the name of the malek, and the villages clustered round the chief's residence are stated to contain a population of 5000 or 6000 souls. From Nourreddin, a march of eight days carried the army to Shendi el Garb, or Shendi on the west bank, which is opposite to the capital of the same name on the eastern side of the river. The former is large and well built, in comparison with other villages on the Upper Nile, and is supposed to contain about 6000 inhabitants. The other is equally large and populous. To the north (he means south) of Shendi, at the foot of some mountains named Attar Bael, are found the remains of a city, temples, and fifty-four pyramids. 'The territory,' he observes, 'in which these ruins are found, is nearly surrounded by rivers, being bounded on the west by the Nile, on the south by the rivers Ratt (Rahed) and Dander, and on the north by the Bahr el Iswoode.' Of the last of these names we know nothing; but we are the more disposed to consider these ruins as the remains of the celebrated Meroé, as their position agrees with that which M. Linant, an admirable draughtsman in the employ of Mr. W. Bankes, has assigned to it, and from whose pen and pencil we hope the public may shortly expect to be gratified, not only with the antiquities of Meroé, but with the whole of the intermediate country as far as Sennaar, where he has long resided. His beautiful drawings and description of the temple of Jupiter Ammon are already in England.

The place of any importance next to Shendi, in proceeding upwards, along the banks of the Nile, is Halfaia, the malek of which, in conjunction with the chief of Shendi, is said to be able 'to bring into the field 30,000 horsemen, mounted on steeds as beautiful as any found in any country in the world.' In the advance towards this place, Malek Chous, chief of the fugitive Sheygy'a, came in and surrendered himself at discretion. 'I have fought,' says he, addressing himself to the pacha, 'against you to the utmost of my means and power, and am now ready, if you will, to fight under the banners of my conqueror.'

The army halted on the western bank of the Nile, opposite Halfaia, where, on the 23d of the moon Shaban (——April), the Nile rose suddenly about two feet. This was occasioned, as they soon discovered, by the rise of the Bahr el Abiad,

which flows into the Bahr el Azrek about five hours' march above Halfaia, the latter of which showed no signs of rising till nearly a month afterwards. Mr. English says, 'The Nile is not half as broad as the Bahar el Abiud, which is, from bank to bank, one mile higher than where the Nile joins it, about a mile and a quarter in breadth. It comes, as far as we can see it, from the W.S.W. The Nile of Bruce must, therefore, after the expedition of Ismael pacha, be considered as a branch of a great and unexplored river, which may possibly be found to be connected with the Niger.' p. 147.

It has been often doubted whether the Azrek rises, as Bruce makes it do, in Gondar; and the following information, which Mr. English received in Sennaar, would seem to comfirm it. 'The source of the Adit (so the people of Sennaar call the river that runs by their city) [*meaning the Azrek*] is in the Gibel el Gumera (that great range of mountains called the mountains of the Moon), about sixty days' march of a camel from Sennaar, in a direction nearly south. It receives, at various distances above Sennaar, several smaller rivers, which come from Abyssinia and from the mountains south of Sennaar;' and this seems to be the opinion of Mr. English. With regard to the course of the Abiad he has not collected much satisfactory information. He was told it was nearly parallel with that of the Adit (Azrek), but that its source was much farther off, among the Gibel el Gumera; that it is augmented by the junction of three other rivers, one from the south-west, and two others from the east, running from the mountains south of Sennaar.

'The water of the Bahar el Abiud,' continues Mr. English, 'is troubled and whitish, and has a peculiar sweetish taste. The soldiers said that 'the water of the Bahar el Abiud would not quench thirst.' This notion probably arose from the circumstance that they were never tired of drinking it, it is so light and sweet. The water of the Nile is at present perfectly pure and transparent, but by no means so agreeable to the palate as that of the Bahar el Abiud, as I experimented myself, drinking first of the Bahar el Abiud, and then walking about 200 yards across the point, and drinking of the Nile, the water of which appeared to me hard and tasteless in comparison. Nothing of the kind could be easier than to ascend the Bahar el Abiud from the place where we are. A canja, well manned and armed, and accompanied by another boat containing provisions for four or six months, and both furnished with grapnels to enable them at night to anchor in the river, might, in my opinion, ascend and return securely; as the tribes on its borders have great dread of fire arms, and will hardly dare to meddle with those who carry them.' pp. 150, 151.

We may now quote the very accurate published account of Mr. Cailland's researches in the neighbourhood of this stream. He set out with the army, after a residence of five months in Sennaar, in November, 1821, traversed the province of Fazoële, or Fazuele, and, following the Bahr el Azrek, entered the kingdom of Bertot, on the western side of that river, which extends westerly to the kingdom of Bourun, and is bounded on the south by that of Darfoke. The whole country is extremely mountainous, covered with dense forests, and almost impassable; yet the pacha led his army through it, mounting his cannon on the backs of camels, for 300 or 400 miles, pursuing, plundering, and carrying off the miserable inhabitants. In Gamenil, between Bertot and Darfoke, the natives collect a small quantity of gold dust from the sand brought down by the rivers: they are all pagans, and M. Caillaud says he discovered among them many customs which resemble those of the ancient Egyptians. At a place called Singué, in the latter kingdom, situated under the tenth parallel of latitude, and five days' journey to the westward of the confines of Abyssinia, the conquests of Ismael pacha terminated.

An able article in the Edinburgh Review, No. 81, discusses the intricate subject of the geography of this extensive region. 'No name in the ancient world,' it is here justly observed, 'was more venerable than that of Ethiopia. As early as Homer, its people are described as the most ancient of nations, and their rites as sacred beyond all others: and, independent of the fabled grandeur thus assigned by superstition and poetry, history, in a distinct, though not detailed manner, represents the Ethiopians as a powerful people, considerably improved in the arts of life. A distinction must however be made in the application of the wide-spread name of Ethiopia. In one sense it implied generally the country of the blacks, and thus included the whole of Central and Tropical Africa. But the region to which this name was applied in a peculiar sense, the civilised and learned Ethiopia, that to which Egypt, whether truly or not, looked up as the fountain of her arts and religion, was confined to the banks of the Upper Nile, and most peculiarly to the island-kingdom of Meroe. The site assigned to this kingdom, and to its celebrated capital of the same name, was such, that it must have been passed over by some of our recent travellers:—And their descriptions, if accurate, should have afforded to Europe the means of ascertaining where it stood, and what monuments it has left behind. A judgment, in fact, has been very decidedly formed; but as it appears to us to be extremely questionable, if not absolutely erroneous, we must be indulged in a short discussion of the question.'

This writer then proceeds to remind us, that all the ancient authorities treat of Meroe as an island, formed by the junction of the Nile with the Astapus, believed to be the Azergue, or river of Abyssinia, and with the Astaboras, which undoubtedly is the Tacazze, called still Atbara.

'The city of Meroe, then, to be within the island thus formed, must, it is supposed, be above this last junction, where indeed it is said by Eratosthenes actually to be. Accordingly, near Shendi, about forty miles above that junction, there have been discovered a range of temples and pyramids, of very considerable extent and magnificence. Bruce, on his passage, partly observed these monuments, and threw out a conjecture that they marked the site of the city of Meroe, and that the kingdom was composed of the extensive region between the Azer-

gue and the Tacazze. This view of the subject, as to the kingdom at least, has been generally adopted in the English maps. M. Caillaud and Mr. English have recently examined these ruins, as well as those at Merawe; and, though Caillaud shows some disposition to prefer the site of Merawe, this idea is crushed in the bud by his editor, Jomard, who entirely adopts the opinion first suggested by Bruce. Mr. Waddington would gladly, for his own credit, have caught at the idea of Caillaud; but, on looking into the ancient authorities, he considered it untenable, and acceded to Shendi. Every other hypothesis, indeed, seems now to be given up; and it appears, from a contemporary journal, that Mr. Bankes, the diligent explorer of the East, has been employing his draughtsman, Mr. Linant, to delineate the ruins of Shendi, as those of Meroe. Notwithstanding so great a concurrence of authorities, we cannot but think it pretty clear, that the city of Meroe was not at Shendi, but at Merawe, and that the kingdoms of the same name coincide; though Meroe, in its glory, probably extended to Dóngola on one side, and Shendi on the other.'

'The first coincidence is that of name, which is complete; for both Burckhardt and Waddington observe, that the modern appellation, though written Merawe, has the precise sound of Meroe. Resemblance of name, indeed, is often accidental, but strict identity not so often; and, amid the general change, it is still common, especially in those unfrequented tracts of Africa, that great capitals should retain their name (Axum, Augila, Assouan). At all events, resemblance, and still more identity, becomes almost decisive, when there is a coincidence also of circumstance and situation. Now, here we have, bearing the name of Meroe, a modern capital, having in its vicinity monuments that exactly correspond in character, magnitude, and antiquity, to those which ought to mark the site of that celebrated metropolis of Ethiopia. There are no other ruins in this country which can be compared to these; for, according to the measurement of Caillaud, those of Shendi are decidedly inferior. The length of the greatest temple there is not quite 280 feet; of that at Merawe it is 450. The height of the highest pyramid at Shendi is twenty-five metres (eighty-one feet); of that at Merawe 103 feet. The base of the former is sixty-seven, of the latter 152 feet. Now, all the ancient accounts unite in representing Meroe as without a rival among the cities of Ethiopia; but if Shendi be Meroe, there must have been a much more splendid capital nearer to Egypt, and yet unknown to Egypt. We have then a combination of circumstances in favor of the position of Merawe, which only the most decided proof would be sufficient to negative. Such proof is, with some apparent reason, supposed to exist in those ancient statements which appear absolutely to require, that Meroe must be above the junction of the Nile and the Tacazze. But a closer examination will probably alter our views as to the decisive nature of these statements. It has never been observed, that by far the highest ancient authority is in direct contradiction to them. To this pre-eminence Ptolemy seems fully entitled, from the advanced era at which he lived, the great extension of commerce and communication in his time, and, in fact, the more accurate and detailed manner in which he lays down his positions. His residence too at Alexandria, then the centre of the commerce of Africa and the East, gives peculiar weight to his authority respecting Egypt and the surrounding countries.' He says, 'Meroe is rendered an island by the river Nile coming from the west, and by the river Astapus coming from the east.

'In it are the following towns:

| | Long. | Lat. |
|---|---|---|
| Meroe . . . . | 61° 30′ | 16° 26′ |
| Sacolche . . . . | 61 40 | 15 15 |
| Eser . . . . | 61 40 | 13 30 |
| Village of the Dari . . | 62 | 12 30 |
| Then the junction of the Nile and Astapus . . | 61 0 | 12 0 |
| Then the junction of the Astaboras and Astapus . | 62 30 | 11 30 |

We need only glance at this table, to perceive that Ptolemy places Meroe far, quite as far as Merawe actually is, below the junction with the Nile, of the Astapus, Astaboras, or any great river whatever. He makes the difference of latitude indeed much too great; but into this error he appears to have been betrayed, by extending his itineraries nearly in a direct line up the river, without allowing for the very circuitous course which it here takes. Beyond Meroe, the knowledge of Ptolemy is first bedimmed; but from Egypt all the way to that point, he gives a close and continued chain of positions; and there is every reason to think, that the intercourse between the countries would be pretty frequent. It seems, then, scarcely possible, that Ptolemy should have been mistaken as to this point; or that so grand a feature should have escaped his notice, as that of the Nile, which, for more than 1000 miles, had not received even a rivulet, receiving, below Meroe, so mighty a tributary as the Tacazze. The statements of Herodotus, though less detailed, appear to point pretty exactly to the same spot. According to him, travellers ascending the Nile, above Elephantine, journeyed the first forty days by land to avoid the cataracts; then embarked, and were conveyed in twelve days to Meroe. The place of embarkation would evidently be about the frontier of Dóngola, where the long chain of cataracts terminates. Twelve days thence to Merawe, would be keeping up very exactly the same rate of travelling; whereas to Shendi it would be out of all sort of proportion. Again, Meroe is stated to be midway between Egypt and the Land of the Exiles, described by other writers as an island formed by the Nile, and which we think is evidently Sennaar, to which the parallel streams of the Azergue and Abiad give much of an insular aspect. Now, Merawe is very exactly midway up the Nile, between Egypt and Sennaar; but Shendi would break up altogether the equality between the two divisions. Strabo, from Eratosthenes,

gives a statement, which appears to point pretty directly to Shendi, and is indeed the only one that can cause a doubt. But elsewhere he describes Meroe as 'bounded upwards on the south by the junction of the rivers Astapus, Astaboras, and Astasobas.' This agrees very closely with our idea on the subject, and is quite contrary to that which would represent the Astaboras (Atbara) as the northern boundary of Meroe. His statement also, that Meroe is the last kingdom of the Ethiopians (Blacks), after which the Nubæ commenced, and occupied the Nile downwards to Egypt, is true only in regard to Merawe. But how then, it will be asked, was the idea so prevalent among ancient geographers, that Meroe was formed by the junction of the great rivers? and how does Ptolemy himself, in the title of his chapter, imply that statement, though its contents are in direct contradiction to it? The following will, we think, afford a sufficient account of the manner in which the error originated.

'All who are conversant with the early history of geography, must be aware of the many errors with which it abounded. Among these none are more frequent than such as respect the continuous course of great rivers, and the distinction between islands and large peninsulas. The latter terms, indeed, are often used as synonymous, though, perhaps, only through the influence of this original error. Now, the reader need only look at the above sketch of the country here considered as Meroe, intersected by three parallel branches of the Nile, to perceive at once how excessively natural it was, that the first imperfect accounts should represent it as an island enclosed by river branches. The original opinion, indeed, which is still to be found in Mela, l. ix. 10, and Pliny, v. 9, was, that the Astapus and Astaboras were branches of the Nile itself, first separating and forming Meroe into a species of Delta, and then re-uniting; an idea which seems to have a peculiar reference to the parallel streams of the modern Meroe. Then, when it was found that the Nile hereabouts received some large tributaries, it was very natural to consider those tributaries as the river branches employed in the formation of Meroe. The original idea thus formed of Meroe, as an island enclosed by them, appears to have become rooted in the minds of geographers, even after they had obtained data by which it was directly negatived. How inconsistent the statement which, under this influence, Ptolemy placed at the head of his chapter, was with the details given by him in it, will be manifest, by observing the vain attempt which the person who afterwards constructed the maps attached to his work, has made to reconcile them, and the strange delineations with which he has thus perplexed all succeeding enquirers. Such are the considerations which, in our apprehension, establish the identity of the ancient with the modern Meroe.'

This writer concludes, by insisting that the arts and improvements of civilised life did not proceed from Upper to Lower Egypt; but, on the contrary, that the early improvements of this part of the world originated altogether in the Delta.

ETHIOPS (martial). Black oxide of iron.

ETHIOPS (mineral). Black sulphuret of mercury.

ETHMOIDES Os, a bone in the inner part of the nose. See ANATOMY. The name of this bone is derived from εθμος, a sieve, and ειδος, form, because it is porous like a sieve. This is perhaps one of the most remarkable bones of the human frame. It appears almost a cube of light, spongy, plates of bone, which are convoluted so as to resemble a honey-comb. It is firmly enclosed in the os frontis, just between the eyes. One horizontal plate receives the olfactory nerves, which, passing through its sieve-like substance, are received in the perpendicular plates, and thus extend the surface of that delicate organ. Another flat plate lies in the orbit of the eye; and, being very smooth, it is named the os planum, or smooth bone. So that the ethmoid bone supports the fore part of the brain, receives the olfactory nerves, forms the organ of smelling, and makes the chief part of the orbit of the eye; and the spongy bones, and the os planum, are neither of them distinct bones, but parts of this ethinoid bone. The principal eminences and depressions of this bone are the crista galli, the perpendicular septum, the spongy laminæ, and the cribrose foramina.

ETHNARCH, ETHNARCHA, of εθνος, a nation, and υρχος, a ruler, a governor of a nation. There are some medals of Herod the Great, on one side of which is Ἡρωδου, and on the other Εθναρχου, i. e. Herod the Ethnarch. This title has been used synonymously with tetrarch, though originally different. Though Herod the Great left by will to Archelaus all Judea, Samaria, and Idumea, yet Josephus says he was then only called ethnarch. See TETRARCH.

ETH'NIC, *adj.*
ETHNIC'ISM, *n. s.*
ETH'NICS, *n. s.*
Gr. εθνικος, from εθνος, the people. Heathen; pagan: ethnics, are heathens; gentiles; pagans.

This first Jupiter of the *ethnicks* was then the same with Cain, the son of Adam. *Raleigh's History.*

A hallowed temple, free from taint of *ethnicism*, makes his muse a saint. *Ben Jonson.*

I shall begin with the agreement of profane, whether Jewish or *ethnick*, with the Sacred Writings. *Grew.*

Such contumely as the *ethnick* world durst not offer him, is the peculiar insolence of degenerated Christians. *Government of the Tongue.*

ETHNOPHRONES; from εθνος, a heathen, and φρονεω, to think; in antiquity, a sect of heretics in the seventh century, who made a profession of Christianity, but joined thereto many of the ceremonies and follies of paganism; as judicial astrology, sortileges, auguries, and other divinations.

ETHULIA, in botany, a genus of the polygamia æqualis order, syngenesia class of plants;

natural order forty-ninth, compositæ. They have tubulose compound flowers, of which the florets are all hermaphrodite. Species seven; natives of the East and West Indies.

ETIO'LOGY, *n. s.* Gr. αιτιολογια. An account of the causes of any thing, generally of a distemper.

I have not particulars enough to enable me to enter into the *etiology* of this distemper. *Arbuthnot.*

ETIQUETTE', *n. s.* Fr. First meaning, according to Cotgrave, a lawyer's book bag, containing the titles of the books, and the names of those to whom they belong: then an account of court ceremonies. Prescribed order or ceremony.

Kiss the slipper or whatever else the *etiquette* of that court requires. *Chesterfield.*

There's nothing in the world like *etiquette*,
In kingly chambers, or imperial halls,
As also at the race and county balls. *Byron.*

ETIQUETTE, Fr. i. e. a ticket or title affixed to a bundle of papers, expressing its contents, is still used, when applied to the Spanish and some other courts, to signify a particular account of what is to be done daily in the king's household, and in the chief ceremonies relating to it. The word is otherwise chiefly used to denote those forms that regulate the decorum of conduct towards persons of various ranks and stations.

ETMULLER (Michael), an eminent physician born at Leipsic in 1646. After having travelled through the greatest part of Europe, he became professor of botany, chemistry, and anatomy, at Leipsic; where he died in 1683. He was a very voluminous writer: his works making 5 vols. folio, as printed at Naples in 1728. They consist principally of Institutiones Medicæ, De Morborum Curationibus, Collegium Practicum Doctrinale, Collegium Chymicum, Synopsis Collegii Institutionum Medicarum, De Corpulentiâ Nimiâ, Fundamenta Medicinæ Veræ, Collegium Pharmaceuticum, Chymia Rationalis et Experimentalis Curiosa, and a treatise De Præscribendi Formulis.

ETMULLER (Michael Ernest), the son of the preceding, was also an ingenious physician who published several works: he died in 1732.

ETNA. See ÆTNA.

ETOILES, in fortification, small star redoubts, which have from five to eight salient points. Each one of their sides, or faces, may contain from twelve to twenty-five toises. This species of fortification has fallen into disuse.

ETON, or EATON, a town of Bucks, on the banks of the Thames, opposite Windsor, with which place it is connected by means of a bridge. It has long been celebrated for its royal college, founded by Henry VI. for the support of a provost and seven fellows, one of whom is vice-provost; and for the education of seventy king's scholars on the foundation, who, when properly qualified, are annually elected to King's College, Cambridge, to which they are removed when any vacancies occur, and can claim a fellowship after three years' residence. But, besides those on the foundation, about 300 gentlemen's sons are generally boarded and educated here, within the bounds of the college. This building consists of two neat quadrangles. In the outermost are the schools and houses for the masters and scholars; and on the south side is the college chapel. On the front is part of the provost's dwelling, and a handsome tower or gateway dividing the two courts. In the centre of the first court is a neat brass statue of its royal founder. The other court consists of the apartments of the provost and fellows of the college. The college library on the south side is, with respect to its architecture, as neat and elegant as any in the kingdom. Its choice collection of books was for the most part presented to the college by Dr. Waddington, bishop of Chichester; Dr. Godolphin, provost; Nicholas Munn, Esq. a late master of the Charter-house; and Richard Topham, Esq. of Windsor; together with many elegant drawings of Greek and Roman antiquities, collected in Rome, at a great expense, by the latter gentleman. At Eton a singular festival is celebrated by the school once every three years, called MONTEM, under which title an account of this ancient custom will be given. The town is twenty-two miles north-west of London.

ETRAPADE, Fr. a sort of crane with a pulley; formerly used among the French to punish military delinquents. The unfortunate wretch had his hands tied behind his back, with ropes fastened to them; he was then hauled up, and suddenly let down within one foot of the ground; so that, by means of the jerk, the limbs must instantly be dislocated. This punishment was formerly in use at Rome, for the purpose of correcting disorderly conduct at the opera, &c.

ETRURIA, or HETRURIA, in ancient geography, a celebrated country in Italy, on the Tiber, bounded by that river, the Macra, the Appennine, and the Tyrrhene Sea. It originally contained twelve different nations, which had each their respective monarch. Their names were Veientes, Clusini, Perusini, Cortonenses, Arretini, Vetuloni, Volaterrani, Ruselluni, Volscinii, Tarquinii, Falisci, and Cæretani. The inhabitants were famous for their confidence in omens, dreams, auguries, &c. They all proved powerful and resolute enemies to the rising empire of the Romans, and were conquered only after much effusion of blood. The principal rivers of this country were the Arnus, the Umbro, the Clanis, and the Tiber. The chief lakes were the Lacus Trasimanus, and Vulsiniensis. Among the most considerable cities were Luna, Pisæ, Luca, Pittoria, Florentia, Fesulæ, Portus Herculis, Labronis, Voluterræ, Sena Julia, Arretium, Cortona, Perusia, Clusium, Vetularii, &c.

ETRURIA, a village of England in Staffordshire, the principal place for potteries in the county, where the most elegant vases of every form and for every use are made. It was founded by Josiah Wedgewood, who died here in 1795.

ETRUSCA TERRA, in the materia medica, a kind of bole of which there are two species, the white and the red; the white Tuscan earth is a dense and compact substance of a dull deadish white, of a smooth surface, not staining the fingers when touched. It is not easily broken, but slightly adheres to the tongue, freely melting in the mouth into a substance like butter. It

makes a slight effervescence with acid menstrua. The red Tuscan earth is a pure bole, very heavy, of a compact texture, and of a dull brownish-red color. It is naturally of a smooth surface, adheres strongly to the tongue, melts freely in the mouth, and has a strong astringent taste. It makes an effervescence with acid menstrua. This is made up in small flat cakes, and impressed with a shield bearing a ducal coronet, &c. It is a medicine prescribed with success in fevers of many kinds, and in diarrhœas, dysenteries, and the like cases.

ETRUSCANS, or Etrusci, in ancient geography, a people of Italy, who inhabited the modern Tuscany, formerly a much more extensive country under the name of Etruria. The Etruscans, in very ancient times, are supposed to have been masters of almost all Italy; for the whole region called Italia by the Latins was denominated by the ancient Greeks Tyrrhenia, according to Dionysius Halicarnassensis (Antiq. Rom. lib. i.); whence it is inferred, that it was formerly subject to the Tyrrhenians, or Etruscans, and from them received that denomination. Livy and Plutarch state that the seas, which partly surround Italy, viz. the Tyrrhenian, Ionian, and Adriatic, were anciently denominated the Etruscan Sea; and that the Etruscans possessed the whole tract extending from the Alps to the straits separating Italy from Sicily. Beyond the Tiber, they built twelve cities, which were afterwards the boundary of Etruria Proper on one side; they were the founders of Nola and Capua, and possessed twelve capital cities in the tract terminated by the Po and the Alps. Virgil and Silius Italicus rank Cæsena and Mantua among the cities of Etruscan extraction. According to Pliny, Bononia, or Bologna, was anciently regarded as the principal city of Etruria; and many Etruscan relics and fragments have been dug up in various provinces of Naples, Verona, and Padua, as well as in the duchy of Tuscany, or Etruria Proper. The kingdom of Latium was probably a colony of the Etruscans; and to them therefore we may trace the first origin of the Roman people. In process of time, the Gauls made several irruptions into Etruria, and seized upon that part of it which lay between the Alps and the Appennines. The first of these incursions happened about 600 years B. C., and the last a little before the taking of Rome by Brennus. Colonies of Greeks made also settlements in the superior part of Etruria; whence it was sometimes denominated Magna Græcia. The Etruscans were likewise dispossessed of a large extent of territory by the Samnites and Ligurians, long before they submitted to the Romans; so that at last they were confined to the limits of Etruria Propria. This we also find called Tyrsenia and Tyrrhenia. It was divided into twelve states or dynasties, each of which had its peculiar city, and each state or tribe was governed by its own prince, called in the Etruscan language Lucumo. See Etruria.

The Tyrseni, or Etruscans, were a branch of the Pelasgi, that according to Dionysius emigrated into Europe, not many ages after the dispersion. The Etruscans denominated themselves Raseni, from their leader Rasan, or Rasen; and Tyrsenus, or Tyrsen, is said to be only the name Resen, with the servile letter T superadded. This serves to evince, not only that the Etruscan name of the people under consideration agreed with that of the Greeks, but likewise that they were both of oriental extraction. These people seem to have derived their appellation Etruscans from Athuria, Aturia or Asigria, their parental country; as may be proved from Dionysius Halicarnassensis, Strabo, and Dio. Aturia and Assyria differ merely in dialect; the former being equivalent to the Chaldæan word אתיריא, and the latter to the Hebrew אשור, as may be seen in Bochart (Phaleg. l. ii. c. 3) and others. The term Tusci, or Thusci, is of a later date, and seems to have been given to the Etruscans by the Greeks. The sacrifices, or use of frankincense, that prevailed among the Tuscans in after ages, probably suggested this appellation.

While each of the twelve tribes, or cantons, called in the Tuscan Language Lucumonia, was governed by its own prince, a king presided over the whole; and convened the general diet of the twelve nations on all pressing emergencies. This was held at the temple of Voltumna, a celebrated city of Etruria, seated on the spot which is occupied, according to Cluverius, by the present city of Viterbo. Although the power of each lucumo was limited, the Etruscan kings seem to have been vested with a sort of absolute oriental authority.

Some of the principal Etruscan laws were: 1. By the original constitution of Etruria, no single state, or lucumony, could enter upon a war, or conclude a peace, with any neighbouring power, without the participation of the whole Etruscan body. 2. The Etruscans, by a particular law (Athen. Deipnos. l. i. p. 23) admitted their women to all nocturnal entertainments; in which they were afterwards followed by the Romans. 3. They obliged themselves to treat all foreigners with the utmost humanity. 4. They gave all possible encouragement, as it should seem, by virtue of their constitution to all polite arts and artificers. 5. In order to deter people from contracting larger debts than they were able to pay, the Tuscan boys, by way of ridicule, followed all insolvent debtors with an empty purse. 6. They must have had many good moral institutions, since from them the Romans received a supplement to their Twelve Tables. 7. The Jura Fecialia were first observed by the Etruscans. 8. The Etruscan polity, in general, seems to have been founded upon maxims of the most consummate wisdom, as may be collected from Aristotle, and Heraclides Ponticus in Athenæus's Deipnos.; to which the curious reader may be referred for further information. The religion of the Etruscans was a gross and multifarious idolatry: in common with the ancient Greeks, and Phœnicians, they worshipped the Cabiri, or Dii magni majorum gentium. They were also initiated in the Samothracian or Cabirian mysteries.

They had also several deities peculiar to themselves, and some which were confined to particular districts. The sacred mysteries of the old Etruscans agreed, in several points, with those of the Greeks, but in others differed from

them, and these they communicated to the Romans long before that nation had any intercourse with the Greeks generally. The festivals, holy days, and stated times of public worship of the Romans and Etruscans must also have agreed in several particulars; as the Romans, before they became acquainted with the Greeks, received every thing relating to religion, and even their calendar itself, from this quarter. The rites and ceremonies used by the haruspices, augurs, and pontifices at Rome, were also derived from the Etruscans, who seem to have been the most celebrated nation in the Pagan world for skill in augury, and the accompanying sacrifices. This was their character among the Romans, as Cicero and Livy have testified. Hence this branch of science was emphatically styled at Rome 'Ars Etrusca,' and 'Disciplina Etrusca;' and Etruria was denominated by Arnobius the mother of superstition. It is here observable, that neither the Etruscans nor the Romans had any magnificent temples in the earlier ages. With regard to the theological notions of the Etruscans, they believed in one supreme Being, whom they called Jave, or Jove; him they considered as the great governor of the universe, and the principle of life and motion. They were also firmly persuaded of the immortality of the soul, and a future state of rewards and punishments; though in later times they seem to have followed the system of Pythagoras, and to have adopted the metempsychosis. However, the generality of the Tuscans adhered to the Sabian superstition.

The Etruscan language was the same, or nearly so, with the Hebrew and Phœnician. The first Pelasgic settlements in Etruria could not have taken place many centuries after the deluge, and at that time the languages, or rather dialects of the Egyptians, Assyrians, Babylonians, Celtes, Syrians, and Arabs, must have approached extremely near to the Hebrew and Phœnician, which the learned allow to have been almost the same. This also appears from the letters and manner of writing anciently used in Etruria. The letters are almost the same with those of the earliest Greeks, brought by Cadmus out of Phœnicia. The manner of writing is purely oriental. The high, and indeed the almost incredible antiquity of the Etruscan language and alphabet, has been clearly evinced in two dissertations, printed at Oxford in the year 1746. For other particulars relating to this subject, we refer to Dempster's Etruria regalis; Gori in his Museum Etruscum, published at Florence in 1737; M. Bourguet's Dissertation published in 1733, and Buonarota's of Florence in 1726; and Swinton's Etruscan Alphabet, published at Oxford; and for an abstract, Anc. Un. Hist. vol. XVIII.

The Etruscans were well versed in all the early arts, and from them the Romans derived that knowledge of them which paved the way to the empire of the world. In the best ages of Rome they imitated the Etruscans; every thing that bore any relation to civil government at Rome, such as ensigns of royalty, the distinction of nobles from plebeians, the secures and fasces, the lictors, &c., was derived from this source. Arms, instruments of military music, military accoutrements and decorations, trophies, triumphs, chariots, crowns, &c., and in short, the whole art of war, or military exercises, were also brought from Etruria. To this may be added the first Roman money, locks and keys, lamps, candlesticks, glasses, cups, drinking vessels, together with the laws and customs relating to banquets and entertainments. Agriculture, planting of vines, all instruments requisite in husbandry, mills, architecture, music, and a variety of musical instruments, many sorts of diversions, especially tragedies, various kinds of garments, and even the rudiments of physic, seem to have been likewise introduced into Italy by the Etruscans. The art of constructing ships and of navigating them, the method of equipping fleets, and all kinds of naval armaments, were certainly known to the Etruscans before the time of Romulus; and hence we may conclude, that this nation must have been a maritime power, and that it must have possessed an extensive commerce in the earlier ages. The Etruscans, who were followers of Pythagoras, and who cultivated the principles of the Italian philosophy, must also have cultivated the art of music and poetry, and have been well versed in natural philosophy and astronomy. Tragedy is said to have owed its birth to this nation; or at least they first communicated it to the Romans. The first actors who appeared upon the stage of Rome were sent for from Etruria. Nor could the ancient Etruscans, valuing themselves upon being the disciples of Pythagoras, be strangers to geometry, nor indeed to any of the mathematical sciences. For military learning they were famous, and especially for the art of drawing up an army, and making dispositions for an engagement. Athenæus informs us, that the formation of the phalanx, and manner of fighting consequent upon it, was invented by the Etruscans. To all the other branches of literature and science for which the Etruscans were distinguished, we may add that they excelled in the knowledge and composition of history. The first person who is said to have fixed monarchical government in Etruria was Janus, supposed by some to be the Javan of Scripture, or one of his posterity, and in subsequent ages deified by his subjects. The history of their succeeding kings is intermixed with much fable, and, of course, very obscure and uncertain. It appears, however, that they were a maritime power in the time of the Argonauts; and that they commanded respect, as such, at least a generation before the Trojan war. That the Etruscans were a powerful and polished nation, when Romulus founded or rather restored Rome, appears from approved authors. That prince could not carry the design he had formed into execution, without their assistance. See *Ancient Universal History*. vol. XVIII.

ETTENHEIM, a town of Baden, in the circle of the Kinzig, having about a league to the east the once rich but now secularised Benedictine abbey of Ettenheim-Munster; it was made over, with the adjacent country, to the grand duke of Baden in 1803. The town stands on the rivulet of Ettenbach, four miles from the Rhine. It is nineteen miles S. S. E. of Strasburg, and has a population of 3000.

ETYMOL'OGY, *n. s.* ETYMOLOG'ICAL, *adj.* ETYMOL'OGIST, *n. s.* ET'YMON, *n. s.* } Fr. *etymologie;* Sp. Port. and Ital. *ethimologia;* Lat. *etymon;* Gr. ἐτυμον, from ἐτυμος true (and λογος). A treatise on the true descent of words; or the true descent stated in any way: the etymon is the origin, or root of a word. See LANGUAGE.

Blue hath its *etymon* from the High Dutch blaw; from whence they call himmel-blue, that which we call sky-colour or heaven's blue. *Peacham.*

Consumption is generally taken for any universal diminution and colliquation of the body, which acceptation its *etymology* implies. *Harvey on Consumption.*

Your lordship here seems to dislike my taking notice that the derivation of the word substance favours the idea we have of it; and your lordship tells me, that very little weight is to be laid on it, on a bare grammatical *etymology.* *Locke.*

Excuse this conceit, this *etymological* observation. *Id.*

When words are restrained, by common usage, to a particular sense, to run up to *etymology,* and construe them by dictionary, is wretchedly ridiculous. *Collier's View of the Stage.*

Pelvis is used by comick writers for a looking-glass, by which means the *etymology* of the word is visible, and pelvidera will signify a lady who looks in her glass. *Addison's Spectator.*

If the meaning of a word could be learned by its derivation or *etymology,* yet the original derivation of words is oftentimes very dark. *Watts's Logick.*

*Etymology* has, no doubt, some use in historical researches; but it is a medium of proof so very fallacious, that where it elucidates one fact, it obscures a thousand; and more frequently borders on the ridiculous than leads to any solid conclusions. *Sir W. Jones.*

Horne Tooke, the ingenious and learned author of the Diversions of Purley, explained those undeclined words of all languages, which had puzzled the grammarians, and evinced from their *etymology,* that they were abbreviations of other modes of expression. *Darwin.*

It is a striking beauty in our English Bible, that, though the language is always elegant and nervous, and for the most part very harmonious, the words are all plain and common; no affectation of learned terms, or of words of Greek or Latin *etymology.* *Beattie.*

EU, a town of France, in the department of the Lower Seine, and late province of Normandy, with a strong castle and an elegant square. Its chief trade is in laces and serges. It is seated on the Bresle, fifteen miles north-east of Dieppe and thirty-six of Rouen.

EV'ACATE, *v. a.* EVAC'UATE, *v. a.* & *v. n.* EVACUA'TION, *n. s.* EVAC'UATOR, *n. s.* } Fr. *evacuer;* Span. and Port. *evacuar;* Ital. and Lat. *evacuare,* from *e* and *vaco;* Heb. בקק, to make void.—Minsheu. To empty; throw out; make empty, or clear; to void, quit: as a neuter verb it is used by Brown in the particular sense of to let blood: an evacuator is one who makes void or annuls.

Popery hath not been able to re-establish itself in any place, after provision made against it, by utter *evacuation* of all Romish ceremonies. *Hooker.*

There is no good way of prevention but by *evacuating* clean, and emptying the church. *Id.*

The defect, though it would not *evacuate* a marriage, after cohabitation and actual consummation; yet it was enough to make void a contract. *Bacon's Henry VII.*

Be not too busy in imitating any father, in excusing the great *evacuators* of the law. *Hammond.*

Consider the vast *evacuations* of men that England hath had by assistances lent to foreign kingdoms. *Hale's Origin of Mankind.*

Dry air opens the surface of the earth to disincarcerate venene bodies, or to *evacate* them. *Harvey on the Plague.*

We tried how far the air would manifest its gravity in so thin a medium, as we could make in our receiver, by *evacuating* it. *Boyle.*

The usual practice of physick among us, turns in a manner wholly upon *evacuation,* either by bleeding, vomit, or some purgation. *Temple.*

If the prophecies recorded of the Messiah are not fulfilled in Jesus of Nazareth, it is impossible to know when a prophecy is fulfilled, and when not, in any thing or person whatsoever, which would utterly *evacuate* the use of them. *South.*

Boerhaave gives an instance of a patient, who by a long use of whey and water, and garden fruits, *evacuated* a great quantity of black matter, and recovered his senses. *Arbuthnot.*

As this neutrality was never observed by the emperor, so he never effectually *evacuated* Catalonia. *Swift.*

Anger and the thirst of revenge are a kind of fever; fighting and law suits, bleeding; at least an *evacuation.* *Shenstone.*

Their efforts, however, were not without some benefit to the Scots, by compelling the English to *evacuate* Haddington, and to surrender several small forts which they possessed in different parts of the kingdom. *Robertson's History of Scotland.*

EVADE, *v. a.* & *v. n.* Fr. *evader;* Lat. *evado,* from *e,* from, and *vado,* to march. To elude; escape; avoid by unexpected methods: as a neuter verb 'to slip away,' as Dr. Johnson says; to practise subtilty or evasion.

We are too well acquainted with those answers;
But his *evasion,* winged thus swift with scorn,
Cannot outfly our apprehensions. *Shakspeare.*
In this point charge him home, that he affects
Tyrannick power: if he *evade* us there,
Inforce him with his envy to the people. *Id.*

His wisdom, by often *evading from* perils, was turned rather into a dexterity to deliver himself from danger, than into a providence to prevent it. *Bacon's Henry VII.*

If thou covet death, as utmost end
Of misery, so thinking to *evade*
The penalty pronounced, doubt not but God
Hath wiselier armed his vengeful ire, than so
To be forestalled. *Milton's Paradise Lost.*
Unarmed they might
Have easily, as spirits, *evaded* swift
By quick contraction or remove. *Milton.*
Him, after all disputes,
Forced I absolve: all my *evasions* vain,
And reasonings, though through mazes lead me still
But to my own conviction. *Id.*

He might *evade* the accomplishment of these afflictions he now gradually endureth. *Browne.*

My argument evidently overthrows all that he brings to *evade* the testimonies of the fathers. *Stillingfleet.*

Our question thou *evadest.* How did'st thou dare
To break hell bounds? *Dryden's State of Innocence.*

We have seen how a contingent even baffles man's knowledge, and *evades* his power. *South.*

Thus he, though conscious of th' etherial guest,
Answered *evasive* of the sly request. *Pope's Odyssey.*

The world replies not;—but the world persists,
And puts the cause off to the longest day,
Planning *evasions* for the day of doom. *Young.*

EVAGA'TION, *n. s.* Lat. *evagor.* The act of wandering; excursion; ramble; deviation.

These long chains of lofty mountains, which run through whole continents east and west, serve to stop the *evagation* of the vapours to the north and south in hot countries. *Ray.*

EVAGRIUS (Scholasticus), a celebrated historian, born at Epiphania, about A. D. 536. He practised as an advocate, from which he was called Scholasticus. He was also tribune, and keeper of the prefect's dispatches. He wrote an ecclesiastical history, commencing where those of Socrates and Theodoret end, with other works, for which he was rewarded by the emperors Tiberius II. and Mauricius. M. de Valois published at Paris an edition of Evagrius's ecclesiastical history, in folio; and it was republished at Cambridge in 1620, by William Reading, with notes of various authors.

EVANDER, in fabulous history, a famous Arcadian chief, said, on account of his eloquence, to have been the son of Mercury, by the prophetess Carmenta. He brought a colony of his people into Italy, about sixty years before the taking of Troy; when Faunus, who then reigned over the Aborigines, gave him a large territory in which he settled with his friends. He is said to have taught the Latins the use of letters, and the art of husbandry. He kindly received Hercules when he returned from the conquest of Geryon, and he was the first who raised to him altars He assisted Æneas against the Rutuli, and distinguished himself by his hospitality. It is said that he first brought the Greek alphabet into Italy, and introduced there the worship of the Greek deities. He was honored as a god after his death, and his subjects raised him an altar on mount Aventine.

EVANES'CENCE, *n. s.*
EVANES'CENT, *adj.*
EVAN'ID, *adj.*
EVAN'ISH, *v. n.*
Lat. *evanescens*; *e* and *vanesco*, to vanish, from *vanus*, void, empty. Disappearance by imperceptible degrees: the adjectives alike mean fading; faint, weak: to evanish is to depart or escape imperceptibly.

Where there is heat and strength enough in the plant to make the leaves odorate, there the smell of the flower is rather *evanid*, and weaker than that of the leaves. *Bacon.*

The decoctions of simples, which bear the visible colours of bodies decocted, are dead and *evanid*, without the commixtion, of alum, argol, and the like. *Browne.*

I put as great difference between our new lights and ancient truths, as between the sun and an *evanid* meteor. *Glanville.*

The difference between right and wrong, on some petty cases, is almost *evanescent.* *Wollaston.*

The canal grows still smaller and slenderer, so as that the *evanescent* solid and fluid will scarce differ. *Arbuthnot.*

The downy orchard, and the melting pulp
Of mellow fruit, the nameless nations feed
Of *evanescent* insects. *Thomson's Spring.*

Of the great principles of truth which the first speculatists discovered, the simplicity is embarrassed by ambitious additions, or the evidence obscured by inaccurate argumentation; and as they descend from one succession of writers to another, like light transmitted from room to room, they lose their strength and splendour, and fade at last in total *evanescence.* *Johnson. Rambler.*

Or like the borealis race,
That flit ere you can point their place;
Or like the rainbow's lovely form
*Evanishing* amid the storm. *Burns.*

Immortal Guide! O, now with accents kind
Give to my ear the progress of the Mind.
How loves, and tastes, and sympathies commence
From *evanescent* notices of sense. *Darwin.*

EVAN'GEL, *n. s.*
EVANGEL'IC, *adj.*
EVANGEL'ICAL, *adj.*
EVANGEL'ICALLY, *adv.*
EVAN'GELISM, *n. s.*
EVAN'GELIST,
EVANGELIST'ARY,
EVAN'GELIZE, *v. a.*
EVAN'GELY, *n. s.*
Fr. *evangelique*; Gr. *ευαγγελικος*, *ευαγγελος*, i. e. *ευ*, good, and *αγγελος*, a messenger, or *αγγελια*, a message. The GOSPEL (see that word): relating to the gospel: evangelism is the promulgation of the gospel; an evangelist one who promulgates it; and is particularly applied to those who first recorded the facts of the life of Jesus Christ, on which it is founded. To evangelise is to teach the gospel: an evangelistary a selection from the gospels: evangely is synonymous with evangel.

The lawe and prophetis til to Jon, fro that tyme the rewme of God is *evangelised*; and ech man doth violence into it. *Wiclif. Luk.* 16.

We suffren alle thingis that we ghyuen no lettyng to the *evangelie* of crist. *Id.* 1 *Cor.* 9.

Good Lucius,
That first received Christianity,
The sacred pledge of Christ's *evangely.*
*Faerie Queene.*

These *evangelical* hymns they allow not to stand in our liturgy. *Hooker.*

Thus was this land saved from infidelity, through the apostolical and miraculous *evangelism.* *Bacon.*

God doth not less approve our *evangelical* sacrifices, than theirs under the law. *Bp. Hall's Contemplations.*

Much rather might the heavenly ministry of the *evangel* bind herself about with far more piercing beams of majesty and awe, by wanting the beggarly help of halings and amercements in the use of her powerful keys. *Milton.*

Sworn to the laws of God and *evangelick* truth. *Id.*

The Spirit
Poured first on his apostles, whom he sends
T' *evangelise* the nations; then on all
Baptized, shall them with wondrous gifts endue. *Id.*

The sin of calumny is set in a most diametrical opposition to the *evangelical* precept of loving our neighbours as ourselves. *Government of the Tongue.*

Each of these early writers ascribe to the four *evangelists* by name their respective histories. *Addison.*

This distinction between moral goodness and *evangelical* perfection, ought to have been observed. *Arbuthnot.*

God will indeed judge the world in righteousness; but 'tis by an *evangelical*, not a legal righteousness, and by the intervention of the man Christ Jesus, who is the Saviour as well as the Judge of the world. *Atterbury.*

Those to whom he first entrusted the promulgating of the gospel, had instructions; and it were fit our new *evangelists* should show their authority. *Decay of Piety.*

Acts of saving grace are *evangelically* good, and well-pleasing to God. *Bp. Barlow.*

The criticks complain that the *evangelistaries* and lectionaries have often transferred their readings into the other manuscripts. *Porson.*

Evangelist is derived from the Greek ευαγγελιον, formed of ευς, good, and αγγελος, angel or messenger. This title was also given in the primitive church to such as preached the gospel in different places, without being attached to any particular church. In this sense some interpreters think, that St. Philip, one of the seven deacons, is called the evangelist, in Acts xxi. 8. St. Paul, writing to Timothy, 2 Eph. iv. 5, bids him do the work of an evangelist: and, in his epistle to the Ephesians, iv. 11, he ranks the evangelists after the apostles and prophets.

Evangelists, four small islands at the western end of the straits of Magellan, near the coast of South America; three of them are low, and the other, at some distance from the rest, has the appearance of a hay-stack. Long. 67° 16′ W., lat. 52° 45′ S.

Evanid Colors are such as are of short duration, as those in the rainbow, in clouds before and after sun-set, &c. They are also called fantastical and emphatical colors.

EVANS (Caleb), a distinguished Baptist minister, born at Bristol, in 1737, where his father was pastor to a respectable congregation. He received his education at a dissenting academy in London, after which he was chosen assistant to his father, and became his successor. Besides attending to the duties incumbent on him, he conducted a seminary for bringing up young men for the pastoral office, with great reputation. He also published Sermons on the Scripture character of the Son and Holy Spirit; a Collection of Hymns, adapted to public worship; an Address to the Serious Professors of Christianity; Christ Crucified, or the Scripture Doctrine of the Atonement, &c. In 1789 he had the degree of D. D. conferred on him by King's College, and died in 1791.

Evans's Island, a small American island, near the coast of Main. Long. 67° 3′ W., lat. 44° 31′ N.

EVANTES, in antiquity, the priestesses of Bacchus, so called, because in celebrating the orgia they ran crying, 'evan! evan! ohè evan!' See Bacchanalia.

EVAP'ORATE, *v. a.*, *v. n.*, & *adj.* } Fr. *evaporer*;
Evap'orable, *adj.* }
Evapora'tion, *n. s.* } Lat. *evaporo*; *e* and *vaporo*, from *vapor*, a vapor. To drive off, or away, in vapor: hence to give vent, or utterance, to thought; to fly away in vapors; waste imperceptibly; disperse in vapor. Evaporable is, easily dispersed, in this way: evaporation is the act or doctrine of evaporating.

Those waters, by rarefaction and *evaporation*, ascended. *Raleigh.*

My lord of Essex *evaporated* his thoughts in a sonnet to be sung before the queen. *Wotton.*

They are but the fruits of adusted choler, and the *evaporations* of a vindictive spirit. *Howel.*

Poesy is of so subtile a spirit, that in the pouring out of one language into another it will all *evaporate.* *Denham.*

Being weary with attending the slow consumption of the liquor, we set it in a digesting furnace to *evaporate* more nimbly. *Boyle.*

This vapour falling upon joints which have not heat enough to dispel it, cannot be cured otherwise than by burning by which it *evaporates.* *Temple.*

Such cordial powders as are aromatick, their virtue lies in parts that are of themselves volatile, and easily *evaporable.* *Grew.*

If we compute that prodigious mass of water daily thrown into the sea from all the rivers, we should then know how much is perpetually *evaporated*, and cast again upon the continents to supply those innumerable streams. *Bentley.*

*Evaporations* are at some times greater, according to the greater heat of the sun: so wherever they alight again in rain, 'tis superior in quantity to the rain of colder seasons. *Woodward.*

Convents abroad are so many retreats for the speculative, the melancholy, the proud, the silent, the politick, and the morose, to spend themselves, and *evaporate* the noxious particles. *Swift.*

We perceive clearly that fire will warm or burn us, and will *evaporate* water. *Watts's Logick.*

Our works unhappily *evaporated* into words; we should have talked less, and done more. *Decay of Piety.*

The state, when now his rising fame was known,
Th' unrivalled genius challenged for her own;
Nor would that one for scenes of action strong,
Should let a life *evaporate* in song. *Young.*

The atmosphere will dissolve a certain quantity of moisture as a chemical menstruum, even when it is much below the freezing point, as appears from the diminution of ice suspended in frosty air; but a much greater quantity of water is *evaporated* and suspended in the air by means of heat, which is perhaps the universal cause of fluidity, for water is known to boil with less heat in vacuo, which is a proof that it will *evaporate* faster in vacuo, and that the air therefore rather hinders than promotes its *evaporation* in higher degrees of heat. *Darwin.*

Evaporation, in natural philosophy, signifies the conversion of fluids, principally water, into vapor, so that it becomes specifically lighter than the atmosphere. Dr. Hutton observes, that it differs from exhalation, which is properly a dispersion of dry particles from a body.

Evaporation is usually produced by heat, and by the change of air: thus, common salt is formed by evaporating all the humidity in the brine or salt water; which is either performed by the heat of the sun, as in the salt works on the sea coast, &c.; or by fire, as at the salt springs, &c.: and it is well known how useful a brisk wind is in drying wet clothes, or the surface of the ground; while, in a calm still atmosphere, they dry very slowly. But, though evaporation be generally an effect of the heat and motion of the air, yet, M. Gauteron, in the Memoires de l' Acad. des Scienc. anno. 1705, shows that a quite opposite cause may have the same effect, and that fluids lose more of their parts in the severest frost, than

when the air is moderately warm: thus, in the great frost of 1708, he found that the greater the cold, the more considerable the evaporation; and that ice itself lost full as much as the warmer liquors that did not freeze.

Water evaporates in every degree of heat from 32° to 212°, which is its boiling point, when it is dissipated in great quantity, and very rapidly. It has also been supposed to evaporate even after its conversion into ice; but some late authors have denied this to be the case. Other liquids, such as spirit of wine or ether, continue to evaporate long after they have been cooled down to the freezing point of water; nor is there any experiment by which it has yet been discovered at what degree their evaporation ceases. Even quicksilver, to appearance a much more heavy and sluggish fluid, and which does not boil without applying almost three times the heat necessary to make water boil, readily evaporates when the pressure of the atmosphere is taken off; and hence the empty parts of barometrical tubes, where the instruments were made with great accuracy and the tubes perfectly exhausted, have been covered with mercurial globules, owing to an invisible vapor ascending from the surface of the metal. In like manner the evaporation of water is very perceptible in some experiments with the air pump. Dr. Priestley found, that, where moisture was carefully excluded from his apparatus, he was never able to produce such a quantity of inflammable air by heating charcoal, as when a little quantity of water was admitted, by moistening the leather on which the receiver stood. Nor is the elasticity of this kind of steam altogether imperceptible; for, in the barometer above-mentioned, the accuracy of the instrument was considerably affected by the steam of the mercury ascending from it, and occupying the void space in the upper part of the glass tube.

There are few subjects of philosophical investigation that have occasioned a greater variety of opinion than the theory of evaporation, or of the ascent of water, in such a fluid as air, between 800 and 900 times lighter than itself, to different heights, according to the different densities of the air; in which case it must be specifically lighter than the air through which it ascends. The Cartesians account for it by supposing that, by the action of the sun upon the water, small particles of the water are formed into hollow spheres and filled with the materia subtilis, which renders them specifically lighter than the ambient air, so that they are buoyed up by it. Dr. Nieuwentyt, in his Religious Philosopher, Contemplation 19, and several others, have alleged that the sun emits particles of fire which adhere to those of water, and form moleculæ, or small bodies, lighter than an equal bulk of air, which consequently ascend, till they come to the height where the air is of the same specific gravity with themselves; and that these particles, being separated from the fire with which they are incorporated, coalesce and descend in dew or rain. Dr. Halley advanced another hypothesis, which has been more generally received: He imagined that, by the action of the sun on the surface of the water, the aqueous particles are formed into hollow spherules, that are filled with a finer air highly rarefied, so as to become specifically lighter than the external air.

Dr. Desaguliers, dissatisfied with the hypotheses of Drs. Nieuwentyt and Halley, proposes another in the Philosophical Transactions, No. 407. He supposes that heat acts more powerfully on water than on common air; that the same degree of heat which rarefies air two-thirds, will rarefy water near 14,000 times; and that a very small degree of heat will raise a steam or vapor from water, even in winter, whilst it condenses the air; and thus the particles of water are converted into vapor by being made to repel each other strongly; and, deriving electricity from the particles of air to which they are contiguous, are repelled by them and by each other, so as to form a fluid which, being lighter than the air, rises in it, according to their relative gravities. The particles of this vapor retain their repellent force for a considerable time, till, by some diminution of the density of the air in which they float, they are precipitated downwards, and brought within the sphere of each other's attraction of cohesion, and so join again into drops of water. Many objections have been urged against this theory, by Mr. Clare in his Treatise of the Motion of Fluids, and by Mr. Rowning in his system of Philosophy; to which Dr Hamilton has added the two following, viz. that if heat were the only cause of evaporation, water would evaporate faster in a warm close room, than when exposed in a colder place, where there is a constant current of air; which is contrary to experience; and that the evaporation of water is so far from depending on its being rarefied by heat, that it is carried on even whilst water is condensed by the coldness of the air, till it freezes; and since it evaporates even when frozen into hard ice, it must also evaporate in all the less degrees of cold. And therefore heat does not seem to be the principal, much less the only cause of evaporation. Others have more successfully accounted for the phenomena of evaporation on another principle, viz. that of solution; and shown, from a variety of experiments, that what we call evaporation is nothing more than a gradual solution of water in air, produced and supported by the same means, viz. attraction, heat, and motion, by which other solutions are effected. The abbé Nollet first started this opinion, though without much pursuing it, in his Leçons de Physique Experimentale, first published in 1743: he offers it as a conjecture, that the air of the atmosphere serves as a solvent or sponge, with regard to the bodies that encompass it, and receives into its pores the vapors and exhalations that are detached from the masses to which they belong in a fluid state, and he accounts for their ascent on the same principles with the ascent of liquors in capillary tubes. On this hypothesis, the condensation of the air contributes, like the squeezing of a sponge, to their descent.

Dr. Franklin, in a paper of Philosophical and Meteorological Observations, Conjectures, and Suppositions, delivered to the Royal Society about 1747, suggested a similar hypothesis. He observes, that the air and water mutually attract each other; and hence he concludes, that water will dissolve in air, as salt in water; every

particle of air assuming one or more particles of water; and, when too much is added, it precipitates in rain. But as there is not the same contiguity between the particles of air as of water, the solution of water in air is not carried on without a motion of the air, so as to cause a fresh accession of dry particles. A small degree of heat so weakens the cohesion of the particles of water, that those on the surface easily quit it, and adhere to the particles of air: a greater degree of heat is necessary to break the cohesion between water and air; for its particles being by heat repelled to a greater distance from each other, thereby more easily keep the particles of water that are annexed to them from running into cohesions that would obstruct, refract, or reflect the heat; and hence it happens that when we breathe in warm air, though the same quantity of moisture may be taken up from the lungs as when we breathe in cold air, yet that moisture is not so visible. On these principles he accounts for the production and different appearances of fogs, mists, and clouds. He adds, that if the particles of water bring electrical fire when they attach themselves to air, the repulsion between the particles of water electrified, joins with the natural repulsion of the air to force its particles to a greater distance, so that the air, being more dilated, rises, and carries up with it the water: which mutual repulsion of the particles of air is increased by a mixture of common fire in the particles of water. When air, loaded with surrounding particles of water, is compressed by adverse winds, or by being driven against mountains, &c., or condensed by taking away the fire that assisted it in expanding, the particles will approach one another, and the air with its water will descend as a dew; or, if the water surrounding one particle of air come in contact with the water surrounding another, they coalesce and form a drop, producing rain; and since it is a well known fact, that vapor is a good conductor of electricity, as well as of common fire, it is reasonable to conclude with Mr. Henley, that evaporation is one great cause of the clouds becoming at times surcharged with this fluid. M. Le Roi, of the Academy of Sciences at Paris, has also advanced the same opinion, and supported it by a variety of facts and observations in the Memoirs for the year 1751. He shows, that water undergoes in the air a real dissolution, forming with it a transparent mixture, and possessing the same properties with the solutions of most salts in water; that the two principal causes, which promote the solution of water in the air, are heat and wind; that the hotter the air is, within a certain limit, the more water it will dissolve; and that at a certain degree of heat the air will be saturated with water; and, by determining at different times the degrees of the air's saturation, he estimates the influence of those causes on which the quantity depends that is suspended in the air in a state of solution. Accordingly, the air, heated by evaporating substances to which it is contiguous, becomes more rare and light, rises and gives way to a denser air; and, by being thus removed, contributes to accelerate the evaporation. The fixed air contained in the internal parts of evaporating bodies, put into action by heat, seems also to increase their evaporation. The wind is another cause of the increase of evaporation, chiefly by changing and renewing the air which immediately encompasses the evaporating substances; and, from the consideration of these two causes combined, it appears why the quantity of vapor raised in the night is less than that in the day, since the air is then both less heated and less agitated. To the objection urged against this hypothesis, on account of the evaporation of water in a vacuum, M. Le Roi answers, that the water itself contains a great quantity of air, which gradually disengages itself, and causes the evaporation; and that it is impossible that a space containing water which evaporates should remain perfectly free from air. To this objection Dr. Dobson of Liverpool replies, that though air appears, by unquestionable experiments, to be a chemical solvent of water, and as such is to be considered as one cause of its evaporation, heat is another cause, acting without the intervention of air, and producing a copious evaporation in an exhausted receiver; agreeably to an experiment of Dr. Irving, who says, that in an exhausted receiver water rises in vapor more copiously at 180° of Fahrenheit's thermometer, than in the open air at 2[illegible], its boiling point. Dr. Dobson farther adds, that water may exist in air in three different states; in a state of perfect solution, when the air will be clear, dry, and heavy, and its powers of solution still active; in a state of beginning precipitation, when it becomes mois. and foggy, its powers of solution are diminished, and it becomes lighter in proportion as its wate is deposited: and, thirdly, when it is completely precipitated, which may happen either by a slower process, when the dissolved water falls in drizzling rain, or by a more sudden process, when it descends in brisk showers.

Dr. Halley, whose theory is mentioned above, has furnished some experiments on the evaporation of water, the result of which is; 1. That water salted to about the same degree as sea water, and exposed to a heat equal to that of a summer's day, did, from a circular surface of about eight inches diameter, evaporate at the rate of six ounces in twenty-four hours: whence by a calculus he finds that, in such circumstances, the water evaporates one-tenth of an inch deep in twelve hours: which quantity, he observes, will be found abundantly sufficient to furnish all the rains, springs, dews, &c. By this experiment, every ten square inches of surface of the water yield in vapor, per day, a cubic inch of water: and each square foot, half a wine pint; every space of four feet square, a gallon; a mile square, 6914 tuns; and a square degree, of sixty-nine English miles, will evaporate 33,000,000 tuns a day; and the whole Mediterranean, computed to contain 160 square degrees, at least 5,280,000,000 tuns each day. Philosophical Transactions, No. 189, or Abridgment, vol. II, p. 108. 2. A surface of eight square inches, evaporated purely by the natural warmth of the weather, without either wind or sun, in the course of a whole year, 16,292 grains of water, or sixty-four cubic inches; consequently, the depth of water thus evaporated in one year

amounts to eight inches. But this being too little to answer the experiment of the French, who found that it rained nineteen inches of water in one year at Paris; or those of Mr. Townley, who found the annual quantity of rain in Lancashire above forty inches; he concludes, that the sun and wind contribute more to evaporation than any internal heat or agitation of the water. In effect, Dr. Halley fixes the annual evaporation of London at forty-eight inches; and Dr. Dobson states the same for Liverpool at thirty-six inches and three quarters. Philosophical Transactions, vol. LXVII, p. 252. 3. The effect of the wind is very considerable, on a double account; for the same observations show a very odd quality in the vapors of water, viz. that of adhering and hanging to the surface that exhaled them, which they clothe as it were with a fleece of vaporous air; which once investing the vapor, it afterwards rises in much less quantity. Whence, the quantity of water lost in twenty-four hours, when the air is very still, was very small, in proportion to what went off when there was a strong gale of wind abroad to dissipate the fleece, and make room for the emission of vapor; and this, even though the experiment was made in a place as close from the wind as could be contrived. Add, that the fleece of water, hanging to the surface of waters in still weather, is the occasion of very strange appearances, by the refraction of the vapors differing from and exceeding that of common air: whence every thing appears raised, as houses like steeples, ships as on land above the water the land raised, and as it were lifted from the sea, &c. 4. The same experiments show that the evaporations in May, June, July, and August, which are nearly equal, are about three times as great as those in November, December, January, and February. Philosophical Transactions, No. 212, or Abridgment, vol. II., p. 110.

Dr. Hamilton, professor of philosophy in the university of Dublin, transmitted to the Royal Society, in 1765, a long dissertation on the nature of evaporation, in which he proposes and establishes the theory of solution; and though other writers had been prior in their conjectures, and even in their reasoning on this subject, Dr. Hamilton assures us, that he has not represented any thing as new, which he was conscious had ever been proposed by any one before him, even as a conjecture. Dr. Hamilton, having evinced the agreement between solution and evaporation, concludes, that evaporation is nothing more than a gradual solution of water in air, produced and promoted by attraction, heat, and motion, just as other solutions are effected. To account for the ascent of aqueous vapors into the atmosphere, this ingenious writer observes, that the lowest part of the air being pressed by the weight of the upper against the surface of the water, and continually rubbing upon it by its motion, attracts and dissolves those particles with which it is in contact, and separates them from the rest of the water. And since the cause of solution in this case is the stronger attraction of the particles of water towards the air, than towards each other, those that are already dissolved and taken up will be still farther raised by the attraction of the dry air that lies over them, and thus will diffuse themselves, rising gradually higher and higher, and so leave the lowest air not so much saturated, but that it will still be able to dissolve and take up fresh particles of water; which process is greatly promoted by the motion of the wind. When the vapors are thus raised, and carried by the winds into the higher and colder parts of the atmosphere, some of them will coalesce into small particles, which slightly attracting each other, and being intermixed with air, will form clouds; and these clouds will float ot different heights, according to the quantity of vapor borne up, and the degree of heat in the upper parts of the atmosphere: and thus clouds are generally higher in summer than in winter. When the clouds are much increased by a continual addition of vapors, and their particles are driven close together by the force of the winds, they will run into drops heavy enough to fall down in rain. If the clouds be frozen before their particles are gathered into drops, small pieces of them, being condensed and made heavier by the cold, fall down in thin flakes of snow. When the particles are formed into drops before they are frozen, they become hail-stones. When the air is replete with vapors, and a cold breeze springs up, which checks the solution of them, clouds are formed in the lower parts of the atmosphere, and compose a mist or fog, which usually happens in a cold morning, and is dispersed when the sun has warmed the air, and made it capable of dissolving these watery particles. Southerly winds commonly bring rain, because, being warm and replete with aqueous vapors, they are cooled by coming into a colder climate; and therefore they part with some of them, and suffer them to precipitate in rain: whereas northerly winds, being cold, and acquiring additional heat by coming into a warmer climate, are ready to dissolve and receive more vapor than they before contained; and therefore, by long continuance, they are dry and parching, and commonly attended with fair weather. Changes of the air, with respect to its density and rarity, as well as its heat and cold, produce contrary effects in the solution of water, and the consequent ascent or fall of vapors. Several experiments prove that air, when rarefied, cannot keep so much water dissolved as it does in a condensed state; and therefore when the atmosphere is saturated with water, and changes from a denser to a rarer state, the high and cold parts of it will let go some of the water before dissolved, forming new clouds, and disposing them to fall down in rain: but a change from a rarer to a denser state will stop the precipitation of the water, and enable the air to dissolve, either in whole or in part, some of those clouds that were formed before, and render their particles less apt to run into drops and fall down in rain. On this account, we generally find that the rarefied and condensed states of the atmosphere are respectively attended with rain or fair weather.

In the Transactions of the American Philosophical Society, vol. III., p. 125, there is an ingenious paper on evaporation, by Dr. Wistar. It is there shown, that evaporation arises when the moist body is warmer than the medium it is en-

closed in. And, on the contrary, it acquires moisture from the air, when the body is colder. This carrying off, and acquiring of moisture, it is shown, is by the passage of heat out of the body, or into it.

Evaporation, according to the experiments of the abbé Nollet, appears to be promoted by electricity. See Electricity, Index. The conclusions drawn from them are, 1. Electricity augments the natural evaporation of fluids; all that were tried, excepting mercury and oil, being found to suffer a considerable diminution, greater than what could be ascribed to any other cause. 2. Electricity augments the evaporation of those fluids the most which are found most readily to evaporate spontaneously: the volatile spirit of sal ammoniac suffering a greater loss than spirit of wine or oil of turpentine, these two more than common water, and water more than vinegar or a solution of nitre. 3. The effects seemed always to be greatest when the vessels containing the fluids were non-electrics. 4. The increased evaporation was more considerable when the vessel which contained the liquor was more open; but the effects did not increase in proportion to the apertures. 5. Electricity was also found to increase the evaporation from solid bodies, and of consequence to augment the insensible perspiration of animals.

Evaporation is one of the great natural processes, by means of which the whole vegetable kingdom is supplied with rain necessary for its support. This evaporation takes place at all times, not only from the surface of the ocean, but of the earth also. Dr. Halley, by an experiment with a pan of water kept in the heat of our summer sun, found that as much water might be reasonably supposed to evaporate from the surface of the Mediterranean Sea as would be sufficient to supply all the rivers which run into it. Dr. Watson, in his Chemical Essays, has shown that the evaporation is not less considerable from the surface of the land than from that of the sea. By inverting a glass vessel on the ground, in the time of a considerable drought, he found that even then about 1600 gallons of water were raised from an acre in twenty-four hours; and, repeating the experiment after a thunder-shower, he found that in such a state an acre parted with above 1900 gallons of water in twelve hours. This evaporation is carried on not only from the ground itself, but from the leaves of trees, grass, &c., with which it is covered; and great part of the water thus raised falls down in the night-time in dew, being absorbed by the vegetables which yielded it before. Thus the earth is not so soon exhausted of water, even for a little way below the surface, as we might imagine from the quantity raised by evaporation: for if all that was raised by the sun's heat during the time of a long drought, left the earth not to return to it for perhaps five or six weeks, the whole vegetable kingdom, at least such as do not strike their roots very deeply into the ground, would of necessity be destroyed; which yet we see is only the case with the most tender grass, and even that only on the most elevated situations, and when most exposed to the sun. Dr. Brownrigg, in his Art of making common Salt, p. 180, fixes the evaporation of some parts of England at 36·8 inches during May, June, July, and August; and the evaporation of the whole year at more than 140 inches. But the evaporation of the four summer months at Liverpool, on a medium of four years, was found to be only 18·88 inches. Without evaporation there would be no dews nor showers; 'without which,' as Dr. Derham observes, 'the trees and plants would languish and die with perpetual drought, but are hereby made verdant and flourishing, gay and ornamental: so that (as the psalmist says, Psalm lxv. 12, 13), The little hills rejoice on every side; the pastures are clothed with flocks; and the valleys shout for joy; they also sing.'—*Physico-Theology*, p. 22.

Another great use of the natural evaporation is to cool the earth, and prevent its being too much heated by the sun. This property of producing cold by evaporation has been but lately observed by chemists, though it has long been employed by those who knew not the reason of their doing so. It has been observed at Aleppo, in Syria, that the water is always coolest when the weather is most warm and the power of the sun excessive. The heats in that part of the world are sometimes almost intolerable; and at that time the evaporation from the outside of the jars, which are made of porous clay, is very copious; and in proportion to the quantity of water evaporated from without is the degree of cold in the liquor within. The reason of this is, that vapor is composed of fire and water united. The consequence is that, wherever there is any quantity of latent heat above 32° of Fahrenheit contained in any body, the water in contact with the surface, or contained in the pores of the body, will gradually absorb it, and, converting it into latent heat, will thus be rendered specifically lighter than the common atmosphere and fly off into it. Thus part of the sensible heat of the body will be carried off; and, as subsequent quantities of water always fly off with more and more of the sensible heat, it is plain that, by continued evaporation of water, almost all the sensible heat above 32° of Fahrenheit will be carried off. If, instead of water, spirit of wine be used, a much greater degree of cold may be produced than by the evaporation of mere water; and if, instead of spirit of wine, we use ether, which is still more volatile than spirit of wine, an excessive degree of cold, scarcely inferior to that which congeals mercury, may be produced. This method of producing cold, by the expensive liquids of ether and spirit of wine, cannot be employed excepting merely for experiment: but that by the evaporation of water may be applied to very useful purposes in warm countries; and it has been customary with seamen to cool their casks of liquors by sprinkling them with sea water. From the theory of evaporation laid down, we may easily see the reason why, in a very warm temperature, animal bodies have the power of producing cold. A vapor, called insensible perspiration, continually issues from the bodies of animals, from human bodies especially, which, carrying off great quantities of their sensible heat, enables them, according to its quantity, to preserve the same temperature in many different degrees of atmospherical heat. For the same reason, also, we see why the continual sprinkling with cold water is so very powerful in depriving

the human body of the heat necessary for the support of life, even though the temperature of the water should not be below what can be easily borne. It has already been shown that, by the evaporation of water, a degree of cold not much inferior to that of freezing water may be produced; and consequently, by continual sprinkling of the body with water, the whole might in time be reduced to nearly the degree of cold in which water freezes. But this is what no human body can bear: and hence we may understand why storms of rain and snow are often fatal; and likewise why, in cases of shipwreck, people have died by being exposed for a few hours to the spray of the sea. The theory of the evaporation of water furnishes us also with a solution of a very curious phenomenon, inexplicable on any other principle, viz. why melting ice will freeze other pieces together more strongly; and, if a considerable degree of heat is not continued for some time, will again consolidate itself into a much harder mass than before. See Ice.

Evaporator, an apparatus calculated for expediting the process of evaporation; a model of which was presented by the inventor, Mr. Browne of Derby, to the Society for the Encouragement of Arts, &c., who conferred on him their gold medal. See Mr. Browne's communication, inserted in the Society's volume for 1794.

Evasion, in law, any subtle endeavour to set aside truth, or to escape the punishment of the law. Thus, if a person says to another that he will not strike him, but will give him a pot of ale to strike him first, and accordingly he strikes, the returning of it is punishable; and, if the person first striking be killed, it is murder: for no man shall evade the justice of the law by such a pretence to cover his malice.

EVATES, or Eubates, a branch of the Druids. Strabo divides the British and Gaulish philosophers into three sects; bards, evates, and druids. He adds that the bards were the poets and musicians; the evates, the priests and naturalists; and the druids, moralists as well as naturalists. See Druids.

EVAUX, a town of France, in the department of Creuse, and ci-devant province of Marche: near which there is a mineral spring and baths; eighteen miles N. N. E. of Aubusson, and twenty-five and a half east of Gueret. Long. 2° 35′ E., lat. 46° 13′ N.

Evaux, or Evaon, a town in the department of La Creuse, France. It is situated on an eminence, and in the neighbourhood are warm salt and sulphur baths. Here are also several ancient monuments of art. Population 2100; twenty-five miles east of Guerat.

EUBŒA, or Abantis, in ancient geography, an oblong island, stretching out between Attica and Thessaly. See Abantis. It is now called Negropont, from its principal town, anciently called Chalcis.

EUCERA, in entomology, a genus of hymenoptera, proposed by Scopoli, and adopted by various late writers. Under this denomination are comprehended those of the Linnæan genus apis which have the mandibles horny, incurvated, acute, and not dentated; jaw elongated, and membranaceous at the tip; lip horny; tongue inflected, and seven-cleft; antennæ cylindrical, quinquefid in the male, often exceeding the length of the body; the abdomen short and downy; female armed with a sting.

EU'CHARIST, *n. s.* }
Eucharistic'al, *adj.* } Fr. *eucharistie;* Span. Port. Ital. and Lat. *eucharistia;* Gr. *ευχαριστια* from *ευ* well and *χαρις*, thanks. The sacrament of the Lord's Supper; any formal act of thanksgiving: the adjective follows these senses.

Himself did better like of common bread to be used in the *eucharist*. *Hooker.*

Some receive the sacrament as a means to procure great graces and blessings, others as an *eucharist* and an office of thanksgiving for what they have received. *Taylor.*

The latter part was *eucharistical*, which began at the breaking and blessing of the bread. *Browne.*

It would not be amiss to put it into the *eucharistical* part of our daily devotions: we praise thee, O God, for our limbs and senses. *Ray.*

Eucharist properly signifies giving thanks; the word *ευχαριστια* literally importing thanksgiving; being formed of *ευς*, good, and *χαρις*, thanks. This sacrament was instituted by Christ himself, and the participation of it is called communion. As to the manner of celebrating the eucharist among some ancient Christians, after the customary oblations were made, the deacon brought water to the bishops and presbyters, standing round the table, to wash their hands; according to the passage of the Psalmist, 'I will wash my hands in innocency, so will I compass thy altar, O Lord.' Then the deacon cried out aloud 'Mutually embrace and kiss each other;' which being done, the whole congregation prayed for the universal peace and welfare of the church, for the tranquillity and repose of the world, for the prosperity of the age, for wholesome weather, and for all ranks and degrees of men. After this followed mutual salutations of the minister and people; and then the bishop or presbyter, having sanctified the elements by a solemn benediction, he brake the bread and delivered it to the deacon, who distributed it to the communicants, and after that the cup. Their sacramental wine was usually diluted or mixed with water. During the administration they sang hymns and psalms; and, having concluded with prayer and thanksgiving, the people saluted each other with a kiss of peace, and departed.

EUCHITÆ, or Euchites. Gr. *ευχιται*, from *ευχη*, prayer, a sect of ancient heretics who were first formed into a religious body towards the end of the fourth century, though their chief doctrines and discipline subsisted in Syria, Egypt, and other eastern countries before the birth of Christ. They were thus called because they prayed without ceasing; imagining that prayer alone was sufficient to save them. They founded their sect on the words of St. Paul, 1 Thess. v. 17, 'Pray without ceasing.' They were also called Enthusiasts and Messalians; a term of Hebrew origin, denoting the same as Euchites. They were a sort of mystics who imagined, according to the oriental notion, that two souls re-

sided in man, the one good and the other evil; and who were zealous in expelling the evil soul or dæmon, and hastening the return of the good spirit of God, by contemplation, prayer, and singing of hymns. They also embraced opinions, nearly resembling the Manichean doctrine, which they derived from the tenets of the oriental philosophy.

EUCHITES, another sect of fanatics, who, in the twelfth century, infested the Greek and eastern churches, and who were charged with believing a double Trinity, rejecting wedlock, abstaining from flesh, treating with contempt the sacraments of baptism and the Lord's supper, and the various branches of external worship, placing the essence of religion solely in external prayer, and maintaining the efficacy of perpetual supplications to the Supreme Being for expelling an evil genius, who dwelt in the breast of every mortal. This sect is said to have been founded by one Lucopetrus, whose chief disciple was named Tychicus. By degrees the title Euchites became a general and invidious appellation for persons of eminent piety and zeal for genuine Christianity, who opposed the vicious practices and insolent tyranny of the priesthood; as the Latins afterwards comprehended all the adversaries of the Roman pontiff under the general terms of Waldenses and Albigenses.

EUCHOLOGIUM, Gr. ευχολογιον, i. e. a discourse on prayer; from ευχη, prayer, and λογος, discourse; the Greek ritual, wherein are prescribed the order and manner of every thing relating to the administration of their ceremonies, sacraments, ordinations, &c. F. Goar has given an edition of it in Greek and Latin, with notes, at Paris.

EU'CHO'LOGY, *n. s.* Gr. ευχολογιον. A formulary of prayers.

EUCLID OF ALEXANDRIA, the celebrated mathematician, flourished in the reign of Ptolemy Lagus, about A.A.C. 280. He reduced all the fundamental principles of pure mathematics, which had been delivered down by Thales, Pythagoras, Eudoxus, and other mathematicians before him, into regularity and order, and added many others of his own discovering; on which account he is said to be the first who reduced arithmetic and geometry into the form of a science. He likewise applied himself to the study of mixed mathematics, and especially to astronomy and optics, in which he also excelled. His works, as we learn from Pappus and Proclus, are The Elements of Geometry; Data; Introduction to Harmony; Phenomena; Optics; Catoptrics; a Treatise of the Division of Superficies; Loci ad Superficiem; Porisms; Fallacies; and four books of Conics. Of these the most celebrated is his Elements, of which there have been numberless editions in all languages. A fine edition of all his works, now extant, was printed in 1703, by David Gregory, Savilian professor of astronomy at Oxford. Euclid was greatly esteemed by king Ptolemy; who once asking him if there was any shorter way of coming at geometry than by his Elements, Euclid answered 'that there was no royal road to geometry.'

EUCLID OF MEGARA, a celebrated philosopher and logician, flourished about A.A.C. 400. The Athenians having prohibited the Megarians from entering their city on pain of death, this philosopher disguised himself in female clothes to attend the lectures of Socrates. After the death of Socrates, Plato and other philosophers went to Euclid of Megara, to shelter themselves from the tyrants who governed Athens. Euclid admitted but one chief good; which he sometimes called God, sometimes Spirit, and sometimes Providence.

EU'CRASY, *n. s.* Gr. ευκρασια. An agreeable well-proportioned mixture of qualities, whereby a body is said to be in a good state of health.

EUDIOMETER, an instrument for ascertaining the purity of the atmospherical air, or the quantity of oxygenous gas or vital air contained in it, chiefly from its diminution on a mixture with nitrous air. See AEROLOGY. Several kinds of these have been invented, of several of which we shall give a short account:—

The first eudiometer, as invented and used by Dr. Priestley, was a divided glass tube, into which, after having filled it with water, and inverted it into the same, one measure or more of common air, and an equal quantity of nitrous air, are introduced by a small phial, which is called the measure; and thus the diminution of the volume of the mixture, which is seen at once by the gradations of the tube, discovers the purity of the air required. Dr. Priestley's discovery was announced to the public in 1772; and several persons, both at home and abroad, presently availed themselves of it, by framing other more accurate instruments.

A preferable method of discovering the purity of the air by an eudiometer, is recommended by M. Fontana. The first simple eudiometer consisted only of a glass tube, as uniformly cylindrical as possible in its cavity, about eighteen inches long, and three-fourths of an inch in diameter in the inside, hermetically sealed at one end. The outside had circles drawn round it, marked with a diamond, three inches from one another, or at such distances as are exactly filled by equal measures of elastic fluids. When the parts of these divisions were required, the edge of a ruler, divided into inches and smaller parts, was held against the tube; so that the first division of the ruler might coincide with one of the marks on the tube. The nitrous and atmospherical air are introduced into this tube to be diminished, and the purity of the atmospheric air thus ascertained; but, that an equal quantity of elastic fluid may always be certainly introduced, M. Fontana contrived a curious instrument as a measure. Notwithstanding the accuracy of this instrument M. Fontana found that it was still liable to some errors, which he endeavoured in vain to remedy.

M. Saussure of Geneva invented an eudiometer which he thought more exact than any of those above described. His apparatus consists of the following parts:—1. A cylindrical glass bottle with a ground stopple, containing about five ounces and a half, which serves as a receiver for mixing the two airs. 2. A small glass phial about one-third of the size of the receiver, to serve as a measure. 3. A small pair of scales which

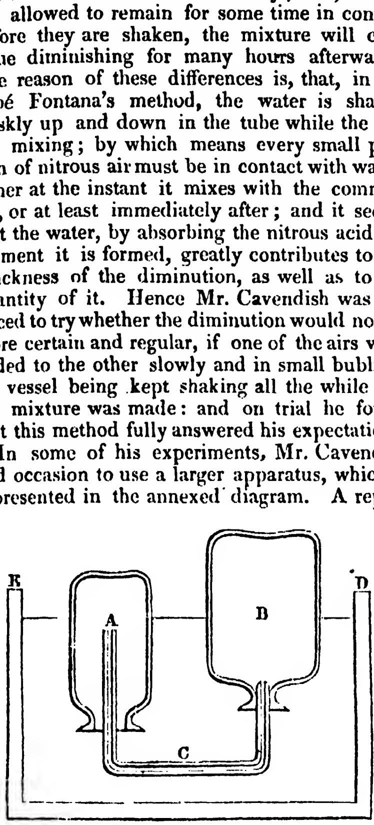
must weigh exactly. 4. Several glass bottles for containing the nitrous or other air to be used, and which may supply the place of the receiver when broken. The whole of this apparatus may be easily packed into a box, and thus transported from place to place, and even to the summits of very high mountains. The method of using it is as follows:—The receiver is to be filled with water, closed exactly with its glass stopple, wiped dry on the outside, and weighed very exactly. Being then immerged in a vessel full of water, and held with the mouth downwards, the stopple is removed, and two measures of common and one of nitrous air are introduced into it by a funnel, one after another: these diminish as soon as they come into contact; in consequence of which the water enters the recipient in proportionable quantity. After being stopped and well shaken, to promote the diminution, the receiver is to be opened under water; then stopped and shaken, and so on for three times successively. At last the bottle is stopped under water, taken out, wiped very clean and dry, and weighed exactly as before. It is plain, that now when the bottle is filled partly with elastic fluid and partly with water, it must be lighter than when quite full of water; the weight of it then being subtracted from the former, the difference shows that quantity of water which would fill the space occupied by the diminished elastic fluid. Now, in making experiments with airs of different degrees of purity, the difference will be greater when the diminution is less, or when the air is less pure, and vice versâ; and thus the comparative purity between two different kinds of airs may be determined. This eudiometer, however, is liable to some errors, principally arising from the inaccuracy of the measure, and the difficulty of stopping the bottle without occasioning a pressure upon the contained elastic fluid.

To avoid the inconveniences to which all the above instruments are subject, Mr. Cavallo employs a glass tube with its scale and measures, the length of the tube being about sixteen or seventeen inches, and between one-half and two-thirds of an inch in diameter, and of as equal a bore as possible throughout; having one end sealed hermetically, and the other shaped like a funnel, though not very wide. The following directions are given by Mr. Cavallo for marking these divisions:—'When the tube is filled with water, a measure of air should be thrown into it; the tube must then be suspended to a hook over the pneumatic trough, by a loop, as represented, so high that the surface of the water within the tube may be very near the surface of the water in the trough, two inches, for instance, above it; then, looking horizontally through the tube, a mark should be made by sticking a bit of soft wax upon the tube, just coinciding with the lower part of the surface of the water within it; in which place afterwards a circular mark should be made with a piece of agate or diamond. Thus the first measure is marked, and in like manner may the rest. The practitioner, however, should never venture to mark the tube with an indelible stroke after one trial, lest he should be mistaken. The proper method is to mark them first with wax, and then repeat the operation once or twice, to correct such errors as might escape the first time; after which the mark may be made with a diamond, flint, or perhaps more conveniently with a file. The polish of the inside of both tube and measure should be taken off with emery; which is a very laborious operation, though it is particularly necessary that the measure should be done in this manner.' To use this eudiometer, fill the tube with water, taking care that no bubbles of air remain in it; and, inverting it with the mouth downwards, leave it in the water leaning against the side of the trough. Fill the measure then with the elastic fluid whose purity is to be tried. Put the eudiometer upon the shelf of the trough, keeping it perpendicular, and with the mouth exactly upon the hole of the shelf, and throw the measure of air into it: fill it again with the same air, and throw this likewise into the tube. Then fill it with nitrous air, and throw this also into the tube, which must be shaken immediately after the operation by moving it alternately up and down in the water of the tub for about a quarter of a minute. It is then left a short time at rest, and suspended by the hook, so that the surface of the water in the inside may be about two inches above that in the tub; when the brass scale is slided upon it till the upper edge of the lower ring coincide with the middle part of the surface of the water within the tube, and then we may observe which division of the scale coincides with any of those on the tube; by which means the quantity of elastic fluid remaining in the tube may be clearly seen, even to the 1-100th part of a measure.' Mr. Cavallo, after giving directions for noting down the results, advises that, in this operation, care should be taken to shake the tube immediately after the nitrous air has been thrown into it, and to leave it at rest afterwards for some time; otherwise the results of similar experiments are far from being alike. By holding the measure or the eudiometer with the hand, which is warmer than the water of the trough, the elastic fluid undergoes some degree of rarefaction, so that the event of the experiments may often be rendered precarious. For this reason the instruments should be held only with the extremities of the fingers and thumb.

In vol. LXXIII. of the Philos. Trans. we have an account of an eudiometer by Mr. Cavendish. He preferred the abbé Fontana's to all the rest; the great improvement in which is, that as the tube is long and narrow, and the orifice of the funnel not much less than the bore of the tube, and the measure made to deliver its contents very quick, the air rises slowly up the tube in one continued column; so that there is time to take the tube off the funnel, and to shake it before the airs come quite into contact; by which means the diminution is much greater and more certain than it would otherwise be. Thus, if equal measures of nitrous and common air are mixed in this manner, the bulk of the mixture will, in general, be about one measure; but, if the airs are suffered to remain in contact about a quarter of a minute before they are shaken, the bulk will hardly be less than one measure and one-fifth; and it will be very different according to the time they are suffered to remain before they are shaken.

In like manner, if, through any fault in the apparatus, the air rises in bubbles, as in that case it is impossible to shake the tube soon enough, the diminution is always less than it ought to be. Another very considerable advantage arising from the method of mixing the airs just mentioned is, that the diminution takes place in its full extent almost instantaneously; but, if they are allowed to remain for some time in contact before they are shaken, the mixture will continue diminishing for many hours afterwards. The reason of these differences is, that, in the abbé Fontana's method, the water is shaken briskly up and down in the tube while the airs are mixing; by which means every small portion of nitrous air must be in contact with water, either at the instant it mixes with the common air, or at least immediately after; and it seems that the water, by absorbing the nitrous acid the moment it is formed, greatly contributes to the quickness of the diminution, as well as to the quantity of it. Hence Mr. Cavendish was induced to try whether the diminution would not be more certain and regular, if one of the airs were added to the other slowly and in small bubbles, the vessel being kept shaking all the while that the mixture was made: and on trial he found that this method fully answered his expectations.

In some of his experiments, Mr. Cavendish had occasion to use a larger apparatus, which is represented in the annexed diagram. A repre-




sents a bottle containing nitrous air inverted into the trough of water D E. B is a bottle fitted with a bent glass tube C. This bottle is to be filled with common air without any water, and is fir slightly warmed by the hand: the end of the glass tube is then put into the bottle of nitrous air as represented in the figure. As the bottle B cools, a little nitrous air runs into it, which instantly loses its elasticity in consequence of coming into contact with the atmospherical air. This condensation occasions an influx of fresh nitrous air, and so on till the whole is exhausted. Thus the nitrous air is added slowly to the other without coming into contact with water, till the whole of it has run out from the bottle A into B; after which the water flows in to supply the vacancy occasioned by the diminution.

In mixing the airs together, Mr. Cavendish commonly added the respirable slowly to the nitrous. The quantities of air made use of, and the diminution of the mixture, are determined by weighing the vessels under water. No sensible error can arise from any difference in the specific gravity of the air; for the thing found by weighing the vessel is the difference of weight of the included air and an equal bulk of water; which, as air is no less than 800 times lighter than water, is very nearly equal to the weight of a quantity of water equal in bulk to the included air. A common balance is not convenient for weighing the bottles under water, without some addition to it: for the lower the vessel of air sinks under water, the more the air is compressed; which makes the vessel heavier, and thereby causes that end of the beam to preponderate. Hence we must either have the index placed below the beam, as in assay balances; or by some other means remove the centre of gravity of the beam so much below the centre of suspension as to make the balance vibrate, notwithstanding the tendency which the compressibility of the air in the vessels has to prevent it.

Scheele's eudiometer is merely a graduated glass cylinder, containing a given quantity of air, exposed to a mixture of iron filings and sulphur, formed into a paste with water. The substances may be made use of in the following manner:—

a quantity of sulphur in powder, and ...ings, into a paste with water, and place the m... ture in a saucer, or plate, over water, on a stan... raised above the fluid; then invert over it a graduated bell-glass, and allow this to stand for a few days. The air contained in the bell-glass will gradually diminish, as will appear from the ascent of the water.

Sir H. Davy passes the nitrous gas into a saturated solution of green muriate of iron, which becomes black and opaque when fully impregnated with the gas. The air to be tried is contained in a small graduated tube, largest at the open end, which is introduced into the solution, and then gently inclined, to accelerate the action, which will be complete in a few minutes, so as to have absorbed all the oxygen. He observes, that the measure must be taken as soon as this is done, otherwise the bulk of the air will be increased by a slow decomposition of the nitric acid formed.

Volta had recourse to the ascension of hydrogen gas. For this purpose, two measures of hydrogen, with three of the air to be examined, are introduced into a graduated tube, and fired by the electric spark. The diminution of bulk, observed after the vessel has returned to its original temperature, divided by three, gives the quantity of oxygen consumed.

Phosphorus and sulphuret of potassa have likewise been employed in eudiometry. A piece of phosphorus may be introduced by means of a lass rod into a tube containing the air to be examined, standing over water, and suffered to remain till it has absorbed its oxygen; which, however, is a slow process. Or a glass tube may be filled with mercury and inverted, and a piece of phosphorus, dried with blotting paper, introduced, which will of course rise to the top. It is there to be melted, by bringing a red-hot iron near the glass, and the air to be admitted by a little at a time. At each addition the phosphorus inflames; and, when the whole has been admitted,

the red-hot iron may be applied again, to ensure the absorption of all the oxygen. In either of these modes one-fortieth of the residuum is to be deducted, for the expansion of the nitrogen, by means of a little phosphorus which it affords.

Seguin's eudiometer, consists of a glass tube, of about one inch in diameter, and eight or ten inches high, closed at the upper extremity. It is filled with mercury, and kept inverted in this fluid in the mercurial trough. A small bit of phosphorus is introduced into it, which, on account of its specific gravity being less than that of mercury, will rise up in it to the top. The phosphorus is then melted by means of a red hot poker, or burning coal applied to the outside of the tube. When the phosphorus is liquefied, small portions of air destined to be examined, and which have been previously measured in a vessel graduated to the cubic inch, or into grains, are introduced into the tube. As soon as the air which is sent up reaches the phosphorus, a combustion will take place, and the mercury will rise again. The combustion continues till the end of the operation; but, for the greater exactness, Seguin directs the residuum to be heated strongly.

Instead of the rapid combustion of phosphorus, Berthollet has substituted its spontaneous combustion, which absorbs the oxygen of atmospheric air completely; and, when the quantity of air operated on is small, the process is accomplished in a short time.

Berthollet's apparatus consists of a narrow graduated glass tube, containing the air to be examined, into which is introduced a cylinder, or stick of phosphorus, supported upon a glass rod, while the tube stands inverted in water. The phosphorus thould be nearly as long as the tube. Immediately after the introduction of the phosphorus white vapors are formed, which fill the tube; these vapors gradually descend, and become absorbed by the water. When no more white vapors appear, the process is at an end, for all the oxygen gas which was present in the confined quantity of air, has united with the phosphorus; the residuum is the quantity of nitrogen of the air submitted to examination.

This eudiometer, though excellent of the kind, is nevertheless not absolutely to be depended upon; for, as soon as the absorption of oxygen is completed, the nitrogen gas exercises an action upon the phosphorus, and thus its bulk becomes increased. It has been ascertained, that the volume of nitrogen gas is increased by one-fortieth part; consequently the bulk of the residuum, diminished by one-fortieth, gives us the bulk of the nitrogen gas of the air examined; which bulk subtracted from the original mass of air, gives us the proportion of oxygen gas contained in it. The same allowance must be made in the eudiometer of Seguin.

The following account of Dr. Ure's eudiometer for measuring the combustible gases by explosion with the electric spark, we extract (by permission) from his well known Dictionary of Chemistry.

It consists of a glass syphon, having an interior diameter of from two-tenths to four-tenths of an inch. Its legs are of nearly equal length, each being from six to nine inches long. The open extremity is slightly funnel-shaped; the other is hermetically sealed; and has inserted near it, by the blow-pipe, two platina wires. The outer end of the one wire is incurvated across, so as nearly to touch the edge of the aperture; that of the other is formed into a little hook, to allow a small spherical button to be attached to it, when the electrical spark is to be transmitted. The two legs of the syphon are from one-fourth to half an inch asunder.

The sealed leg is graduated by introducing successively equal weights of mercury from a measure glass tube. Seven ounces troy, and sixty-six grains, occupy the space of a cubic inch; and 34¼ grains represent $\frac{1}{100}$ part of that column. The other leg may be graduated also, though this is not necessary. The instrument is then finished.

To use it, we first fill the whole syphon with mercury or water, which a little practice will render easy. We then introduce into the open leg, plunged into a pneumatic trough, any convenient quantity of the gases, from a measure glass tube, containing them previously mixed in determinate proportions. Applying a finger to the orifice, we next remove it from the trough in which it stands, like a simple tube; and, by a little dexterity, we transfer the gas into the sealed leg of the syphon. When we conceive enough to have been passed up, we remove the finger, and next bring the mercury to a level in both legs, either by the addition of a few drops, or by the displacement of a portion, by thrusting down into it a small cylinder of wood. We now ascertain, by careful inspection, the volume of included gas. Applying the fore-finger again to the orifice, so as also to touch the end of the platina wire, we then approach the pendent ball or button to the electrical machine, and transmit the spark. Even when the included gas is considerable in quantity, and of a strongly explosive power, we feel at the instant nothing but a slight push or pressure on the tip of the finger. After explosion, when condensation of volume ensues, the finger will feel pressed down to the orifice by the superincumbent atmosphere. On gradually sliding the finger to one side, and admitting the air, the mercurial column in the sealed leg will rise more or less above that in the other. We then pour in this liquid metal, till the equilibrium be again restored, when we read off as before, without any reduction, the true resulting volume of gas.

As we ought always to leave two inches or more of air, between the finger and the mercury, this atmospheric column serves as a perfect recoil spring, enabling us to explode very large quantities without any inconvenience or danger. The manipulation is also, after a little practice, as easy as that of the single tube. But a peculiar advantage of this detachable instrument is, to enable us to keep our pneumatic troughs, and electrical machine, at any distance which convenience may require; even in different chambers, which, in the case of wet weather, or a damp apartment, may be found necessary to ensure electrical excitation.

We may analyse the residual gaseous matter, by introducing either a liquid or a solid re-agent.

We first fill the open leg nearly to the brim with quicksilver, and then place over it the substance whose action on the gas we wish to try. If liquid, it may be passed round into the sealed leg among the gas, but if solid, fused potassa; for example, the gas must be brought round into the open leg, its orifice having been previously closed with a cork or stopper. After a proper interval, the gas being transferred back into the graduated tube, the change of its volume may be accurately determined. With this eudiometer, and a small mercurial pneumatic cistern, we may perform pneumatic analyses on a very considerable scale.

In making experiments of this kind, several phenomena occur, which should be attended to: 1. When respirable air is mixed with nitrous air their joint bulk is diminished, and the diminution is greater when the air is purer, ceteris paribus, and vice versâ. 2. On mixing the two airs together all at once, the ensuing diminution is greater than if the same quantity of nitrous air be added to an equal quantity of respirable air at different times: and hence it follows, that, the quicker the two sorts of elastic fluids are mixed together, the greater is the diminution, and contrarywise. 4. Nitrous airs of different qualities occasion a different degree of diminution with respirable air; and, therefore, care should be taken to use such materials as afford air always of the same quality. The most proper substance for this purpose is very pure quicksilver; a quarter of an ounce or even less, with a proper quantity of diluted nitrous acid, will produce a great deal of nitrous air, which is always of the same quality, provided the metal be always of equal purity; but with other metals, as brass, copper, &c., the nitrous air made at one time is often different from that made at another, and therefore occasions a greater or less diminution when mixed with common air though precisely of the same sort. 4. The quality of nitrous air is impaired by keeping, especially when in contact with water; and for this reason it ought to be prepared fresh every two or three days. 5. In performing these experiments, it should be carefully remarked, that no mistake arise from heat or cold; as the elastic fluids are easily contracted or expanded by any variation of temperature. 6. Though the greatest diminution takes place immediately after mixing the respirable and nitrous airs together, especially when they are agitated, yet they continue to diminish a little for some time after; for which reason the diminution should be observed always at a certain time after the mixture is made. The whole process indeed ought always to be performed in a uniform manner otherwise the results will be frequently very dissimilar. 7. It must be remarked, that the surface of the water which lies contiguous to the elastic fluid contained in a small vessel, is very far from being a plane, or even from being always of a similar figure in the same vessel, on account of the attraction or repulsion between the substance of the glass and water. This is altered by many circumstances, particularly by the adhesion of extraneous bodies; whence it is very improper to use common open phials for this purpose. We must also take into consideration the drops of water adhering to the sides of the vessel, and the quality of the water in which the operation is performed. 8. In case the experiment is to take up some hours, in order to observe the last diminution, it will be proper to notice, by a good barometer, if the gravity of the atmosphere has suffered any alteration during that time; for a difference in its pressure may occasion some difference in the result of the experiments. 9. A simple apparatus is always to be preferred to a more complicated one, even though the latter should appear to have some advantage over it in point of accuracy. Complex machines are not only expensive, and subject to be easily put out of order, but occasion frequent mistakes, on account of the operator having generally many things to do and keep in proper order; whence it is easy to overlook some of them

EUDOCIA, or Eudosia, a celebrated lady, the daughter of Leontius, a philosopher of Athens; who gave her a learned education, and at his death left her only a small legacy, saying she was capable of making her own fortune. Pleading at Athens against her two brothers, for a share in her father's estate, without success, she carried her cause personally by appeal to Constantinople; recommended herself to Pulcheria, the sister of the emperor Theodosius II., embraced Christianity, was baptised by the name of Eudosia, her original name being Athenais, and was soon after married to the emperor. A difference at length taking place, on account of the emperor's jealousy, excited by Chrysapius, the eunuch, she retired to Jerusalem, where she spent many years in building and adorning churches, and in relieving the poor. Dupin says that she did not return thence till after the emperor's death; but Cave informs us, that she was reconciled to him, returned to Constantinople, and continued with him till his death; after which she went again to Palestine, where she spent the remainder of her life in pious works. She died A. D. 459 or 460. She wrote a Paraphrase on the First Eight Books of the Old Testament, in heroic verse; another in prose on Daniel and Zechariah; a History of St. Cyprian and Justina; and a Life of Christ, in heroics, with many other poems, which are lost.

EUDOXIANS, a sect of heretics in the fourth century, who adhered to the errors of the Arians and Eunomians, maintaining that the Son was created out of nothing; that he had a will different from that of the Father, &c.

EUDOXIUS, the founder of the sect of the Eudoxians, was patriarch of Antioch and Constantinople, and succeeded Macedonius in the latter see, A. D. 360. He was a zealous defender of the Arian doctrines, and died A. D. 370.

EUDOXUS, a celebrated astronomer of Cnidus, in Caria, who flourished about A. A. C. 370. He studied geometry under Archytas, and travelled into Egypt to learn the sciences. There he studied, together with Plato, for thirteen years; after which they came to Athens, where Eudoxus taught with great renown. Eudoxus composed Elements of Geometry, from which, Proclus tells us, Euclid himself borrowed liberally. Cicero calls Eudoxus the greatest astro-

nomer that ever lived; and Petronius says, he spent the latter part of his life on the top of a high mountain, that he might contemplate the stars with more convenience. Strabo says, the remains of his observatory were to be seen at Cnidus in his time. He died in his fifty-third year.

EVE, *n. s.* | E'VEN, | EV'ENING, | EV'ENING-STAR, | EV'ENSONG, | EV'ENTIDE. } Sax. æpen; Dut. *avend;* Goth. *ibn;* all also denoting equal, evening being the equal division between light and darkness. Todd But Minsheu derives it from Heb. ערב, to obscure; through Teut. *abend*, night, or Gr. *α* privative, and *φαινω*, to be light, to shine. Declining day; the close of the day; the obscure interval between light and darkness; the vigil, or preparatory fast before a church holiday. Evensong is a hymn for the evening: and hence the time itself when it was sung, or synonymous with eventide.

And the day was the *eeuen* of the holiday: and the Sabboth began to schyne. *Wiclif. Luk* 24.

And whanne *eventide* was comun hise disciplis went down to the see. *Id. Jon.* 6.

Isaac went out to meditate at the *eventide*. *Gen.* xxiv. 16.

——— And now the *eventyde*
His brode black wings had through the heavens wyde
By this dispred. *Spenser. Faerie Queene.*

They, like so many Alexanders,
Have in these parts from morn 'till *even* fought,
And sheathed their swords for lack of argument.
*Shakspeare.*

I shall fall
Like a bright exhalation in the *evening*,
And no man see me more. *Id. Henry VIII.*

Behold the longest day hath its *evening*. *Raleigh.*

The devil is now more laborious than ever, the long day of mankind drawing towards an *evening*, and the world's tragedy and time near at an end. *Id.*

Let the immediate preceding day be kept as the *eve* to this great feast. *Duppa's Rule of Devotion.*

If a man were but of a day's life, it is well if he last till *evensong*, and then says his compline an hour before the time. *Taylor.*

Thee, 'chantress of the woods among,
I woo to hear thy *evensong*. *Milton.*

Such sights as youthful poets dream
On Summer *eves* by haunted stream. *Id.*

Joyous the birds; fresh gales and gentle airs
Whispered it to the woods, and from their wings
Flung rose, flung odours from the spicy shrub,
Disporting, till the amorous bird of night
Sung spousal, and bid haste the *evening-star*
On his hill top to light the bridal lamp. *Id.*

The unerring sun by certain signs declares,
What the late *even*, or early morn prepares.
*Dryden.*

Mean time the sun descended from the skies,
And the bright *evening-star* began to rise. *Id.*

He tuned his notes both *evensong* and morn. *Id.*

When the sun's orb both *even* and morn is bright,
Then let no fear of storms thy mind affright. *May.*

It was the sacred rule among the Pythagoreans, that they should every *evening* thrice run over the actions and affairs of the day. *Watts on the Mind.*

Winter, oft at *eve*, resumes the breeze,
Chills the pale morn. *Thomson's Spring.*

But such self-inspection, however, should not fail to make part of our *evening* devotions. *Mason.*

So on his nightmare through the *evening* fog
Flits the squab fiend o'er fen, and lake, and bog;
Seeks some love-wildered maid with sleep oppressed,
Alights, and grinning sits upon her breast.
*Darwin.*

When in the crimson cloud of even
The lingering light decays,
And Hesper on the front of Heaven
His glittering gem displays. *Beattie.*

As clouds from yonder sun receive
A deep and mellow dye,
Which scarce the shade of coming *eve*
Can banish from the sky. *Byron.*

And Ardennes waves above them her green leaves
Dewy with nature's tear-drops, as they pass,
Grieving, if aught inanimate e'er grieves,
Over the unreturning brave,—alas!
Ere *evening*, to be trodden like the grass
Which now beneath them, but above shall grow
In its next verdure, when this fiery mass
Of living valour, rolling on the foe
And burning with high hope, shall moulder cold and low. *Id.*

EVELYN (John), a learned writer, and natural philosopher, born at Wotton in Surry, the seat of his father, in 1630. After making the tour of Europe, he returned about 1651, and lived very retired at his rural retreat, Say's Court, near Deptford in Kent. He was very assiduous in transmitting to the Royal Society whatever fell within the compass of his enquiries; and used humbly to style himself pioneer in the service. 'His life,' says Mr. Walpole, 'was a course of enquiry, study, curiosity, instruction, and benevolence. The works of the Creator, and the mimic labors of the creature, were all objects of his pursuit. He unfolded the perfections of the one, and assisted the imperfections of the other. He adored from examination; was a courtier that flattered only by informing his prince, and pointing out what was worthy of him to countenance. He was one of the first promoters of the Royal Society, a patron of the ingenious and indigent, and, besides his writings and discoveries, he obtained the Arundelian marbles for the University of Oxford, and the Arundelian library for the Royal Society.' There are five small prints of his journey from Rome to Naples, drawn and etched by him; and among his published works are, 1. A Character of England; 2. The State of France; 3. An Essay on the First Book of Lucretius De rerum Naturâ; 4. The French Gardener; 5. A Panegyric on King Charlas II.'s Coronation; 6. Fumifugium, or the Inconveniences of the Air and Smoke of London Dissipated; 7. The History and Art of Engraving on Copper; 8. A Parallel between the Ancient Architecture and the Modern; He died in 1706, and his "Diary" has since been published by Mr. Upcott, of the London Institution.

E'VEN, *adj.*. *v. a.* & *v. n.* | EVEN'HANDED, *adj.* | E'VENLY, *adv.* | E'VENER, *n. s.* | E'VENNESS, *n. s.* } Sax æpen; Goth. *efn* or *ibn;* Icel. *iafn;* Teut. *eben;* Belg. *even*, equal. See the foregoing word. Perhaps from Heb. אבן; perpendicular, straight (Minsheu). Level, smooth, equal, uniform: very variously applied, as to equality of condition, temper, parts, or number of parts: the

state of accounts between debtor and creditor, &c. To even, is to make equal to: an evener, one that makes things or persons even.

But thilke servaunt gede out, and fonde oon of his *even* servauntis that oughte him an hundrid peens, and he heelde him and stranglide him, &c.
*Wiclif. Matt.* 18.

And his *evene* servauntis seynge the thingis that weren don sorowden greetly. *Id.*

Therefore the Jewis soughten more to sle him for not ooneli he brak the Saboth, but he seyde, that God was his fadir, and made him *euene* to God.
*Id. Jon.* v.

That the net way be *even* to the midst of the altar.
*Exodus.*

And shall lay thee *even* with the ground.
*Luke* xix. 44.

*Even* so did those Gauls possess the coast.
*Spenser.*

Hail *evener* of old law and new!
*Old Hymn to the Virgin, Quoted by Warton.*

A crooked stick is not straitened, unless it be bent as far on the clear contrary side, that so it may settle itself at the length in a middle state of *evenness* between both. *Hooker.*

The upper face of the sea is known to be level by nature, and *evenly* distant from the centre, and waxes deeper and deeper the farther one saileth from the shore. *Brerewood.*

Thou wast a soldier
*Even* to Cato's wish; not fierce, and terrible
Only in strokes.
*Shakspeare. Coriolanus, Act* i, *Scene* 4.

Nothing can, or shall content my soul,
'Till I am *evened* with him, wife for wife. *Id.*
He was
A noble servant to them; but he could not
Carry his honours *even.* *Id. Coriolanus.*

*Evenhanded* justice
Returns the ingredients of our poisoned chalice
To our own lips. *Id. Macbeth.*

This temple Xerxes *evened* with the soil, which Alexander is said to have repaired. *Raleigh.*

In taking revenge, a man is but *even* with his enemy; but in passing it over, he is superior.
*Bacon's Essays.*

You serve a great and gracious master, and there is a most hopeful young prince: it behoves you to carry yourself wisely and *evenly* between them both.
*Id. Advice to Villiers.*

When Alexander demanded of one what was the fittest seat of his empire, he laid a dry hide before him, and desired him to set his foot on one side thereof; which being done, all the other parts of the hide did rise up; but when he did set his foot in the middle, all the other parts lay flat and *even.*
*Davies.*

A palish clearness, *evenly* and smoothly spread; not over thin and washy, but of a pretty solid consistence. *Wotton.*

I do confess
The blind lad's power, while he inhabits there;
But I'll be *even* with him nevertheless. *Suckling.*

A like strange observation taketh place here as at Stonehenge, that a redoubled numbering never *eveneth* with the first. *Carew.*

Beat, roll, and mow carpet-walks and camomile; for now the ground is supple, and it will *even* all inequalities. *Evelyn.*

Now might Moses have found a time to have been *even* with Israel, for all their unthankfulness, and mutinous insurrections. *Bp. Hall's Contemplations.*

Let him tell me whether the number of the stars be *even* or odd. *Taylor's Rule of Holy Living.*

Upheld by me, yet once more he shall stand
On *even* ground against his mortal foe. *Milton.*

It is not much that the good man ventures; after this life, if there be no God, he is as well as the bad; but if there be a God, is infinitely better, *even* as much as unspeakable and eternal happiness is better than extreme and endless misery. *Tillotson.*

The motions of all the lights of heaven might afford measures of time, if we could number them; but most of those motions are not evident, and the great lights are sufficient, and serve also to measure *even* the motions of those others. *Holder.*

Nor death itself can wholly wash your stains,
But long contracted filth *even* in the soul remains.
*Dryden.*

To see a beggar's brat in riches flow,
Adds not a wrinkle to my *even* brow. *Id.*

All I can say for those passages is, that I knew they were bad enough to please *even* when I wrote them. *Id.*

The ether most readily yieldeth to the revolutions of the celestial bodies, and the making them with that *evenness* and celerity is requisite in them all.
*Grew's Cosmologia Sacra.*

*Even* reckoning makes lasting friends; and the way to make reckonings *even* is to make them often.
*South.*

I have made several discoveries which appear now, *even* to those who are versed in critical learning.
*Addison's Spectator.*

The publick is always *even* with an author who has not a just deference for them: the contempt is reciprocal. *Id.*

The present face of Rome is much more *even* and level than it was formerly. *Id. On Italy.*

Lay the rough paths of peevish nature *even*,
And open in each heart a little heaven. *Prior.*

Since you refined the notion, and corrected the malignity, I shall *e'en* let it pass. *Collier.*

The superficies of such plates are not *even*, but have many cavities and swellings, which, how shallow soever, do a little vary the thickness of the plate.
*Newton's Opticks.*

In change of torment would be ease:
Could you divine what lovers bear,
*Even* you, Prometheus, would confess
There is no vulture like despair. *Granville.*

Though he appeared to relish these blessings as much as any man, yet he bore the less of them, when it happened, with great composure and *evenness* of mind. *Atterbury.*

He might *even* as well have employed his time, as some princes have done, in catching moles. *Id.*

The true reason of this strange doctrine was to be *even* with the magistrate, who was against them; and they resolved at any rate to be against him. *Id.*

In an infinite chaos nothing could be formed; no particles could convene by mutual attraction; for every one there must have infinite matter around it, and therefore must rest for ever, being *evenly* balanced between infinite attractions. *Bentley.*

Here all their rage, and *even* their murmurs cease,
And sacred silence reigns, and universal peace.
*Pope.*

Desires composed, affections ever *even*,
Tears that delight, and sighs that waft to heaven.
*Id.*

Books give the same turn to our thoughts that company does to our conversation, without loading our memories, or making us *even* sensible of the change. *Swift.*

To appear wise nothing more is requisite here, than for a man to borrow hair from the heads of all his neighbours, and clap it like a bush on his own: the distributors of law and physic stick on such quantities, that it is almost impossible *even* in idea to distinguish between the head and hair. *Goldsmith.*

The commonwealth of kings, the men of Rome!
And *even* since, and now, fair Italy!
Thou art the garden of the world, the home
Of all art yields, and nature can decree;
*Even* in thy desert, what is like to thee?
Thy very weeds are beautiful, thy waste
More rich than other climes' fertility;
Thy wreck a glory, and thy ruin graced
With an immaculate charm which cannot be defaced.
*Byron.*

EVENT', *n. s.*
EVENT'FUL, *adj.*
EVENT'UAL,
EVENT'UALLY, *adv.*
Fr. *evenement*; Italian *evenimento*; Lat. *eventus*, from *evenio* to happen, à *e* forth and *venio*, to come. An incident or occurrence of whatever nature; any thing that proceeds regularly from its causes or beginning: thus eventual and eventually mean ultimate and ultimately, consequential, and in the last result: eventful is full of incidents or changes of affairs.

There is one *event* to the righteous and to the wicked. *Eccl.*

Oh heavy times, begetting such *events*!
*Shakspeare*

Last scene of all,
That ends this strange *eventful* history,
Is second childishness. *Id. As You Like It.*

Hermione has but intentionally, not *eventually*, disobliged you; and hath made your flame a better return, by restoring you your own heart. *Boyle.*

Two spears from Meleager's hand were sent,
With equal force but various in the *event*;
The first was fixed in earth, the second stood
On the boar's bristled back, and deeply drank his blood. *Dryden.*

It is madness to make fortune the mistress of *events*, because in herself she is nothing, but is ruled by prudence. *Id.*

It is for him only that sees the *event*, ere he appoint the means, not to be deceived.
*Bp. Hall's Contemplations.*

O my soul, think, and think again what it is to die.—Do not put that most awful *event* far from thee: nor pass it by with a superficial thought.
*Mason.*

It is during the time that we lived on this farm that my little story is most *eventful*. *Burns.*

I left you fretful and passionate—an untoward accident drew me into a quarrel—the *event* is, that I must fly this kingdom instantly. *Sheridan.*

EVENTERATE, *v. a.* Lat. *eventero*. To rip; to open by ripping the belly.

In a bear, which the hunters *eventerated*, or opened, I beheld the young ones, with all their parts distinct.
*Browne.*

EVENT'ILATE, *v. a.*
EVENTILA'TION, *n. s.*
Lat. *eventilo*, *e* and *ventilo*, to blow; to winnow by aid of the wind; to ventilate.

It (the vital flame) requires constant *eventilation* through the trachea and pores of the body.
*Bishop Berkeley.*

EV'ER, *adv.*
EV'ER A, *adj.*
EV'ER-BUBBLING,
EV'ER-BURNING,
EV'ER-FAIR,
EV'ERGREEN, *adj.* & *n. s.*
EV'ER-HONORED, *adj.*
EV'ERLASTING, *adj.* & *n. s.*
EV'ERLASTINGLY. *adv.*
EV'ERLASTINGNESS, *n. s.*
EV'ERLIVING, *adj.*
EV'ERMORE, *adv.*
EV'ER-OPEN, *adj.*
EV'ER-PLEASING,
EV'ER-WATCHFUL,
EV'ER-YOUNG.
Sax. æfne; Goth. *æve*, from *æ* always, and *vera*, to be; Teut. *evig*, a corruption, says Minsheu, of Latin *ævum*, eternity. See ETERNITY. At one time, at any time, at all times; hence, in any degree: always, endlessly. As an expletive it emphatically expresses both the tim immediately succeeding an event, and the time following, indefinitely; as, as soon as ever; ever since: or, at any time, as in the example from Shakspeare, That *ever* this fellow, &c. Dr. Johnson says, that *ever a*, as, *ever* a boy, is properly everich, Sax. or ever each boy. See EVERY. For ever is for all time, or for always, indefinitely: hence for the term of life or any understood state of being, see the instance from Exod xxi.: hence also 'for ever and ever,' is for, or unto, eternity. The compounds appear to require no explanation.

His master shall bore his ear through with an aul, and he shall serve him *for ever*. *Exod.* xxi. 6.

But hou manye *euer* resceyden him he gaf to hem power to be maad the sones of God, to hem that beleueden in his name. *Wiclif Jon.* 1.

And we witen, that if oure ertheli hous of this dwellynge be dissolued, the we han a bildyng of God, an hous not maad bi hondis *euerlastinge* in heuenes.
*Id.* 2 *Cor.* 5.

They brake all their bones in pieces, or *ever* they came at the bottom of the den. *Dan.* iv. 24.

Trust shall I God, to entre in a while.
Hys hauen or heauen sure and veniforme
*Euer* after thy calme, loke I for a storme.
*Sir T. More.*

So long as Guyon with her communed,
Unto the ground she cast her modest eye;
And *ever* and anon, with rosy red,
The bashful blood her snowy cheeks did dye.
*Faerie Queene.*

His tail was stretched out in wonderous length,
That to the house of heavenly gods it raught;
And with extorted power and borrowed strength,
The *everburning* lamps from thence it brought. *Id.*

But sith now safe ye siezed have the shore,
And well arrived are, high God be blest,
Let us devise of ease and *everlasting* rest. *Id.*

Is not from hence the way, that leadeth, right
To that most glorious house, that glistereth bright
With burning stars and *everliving* fires? *Id.*

So well, they say,
It governed was, and guided *evermore*. *Id.*

God hath had *ever*, and *ever* shall have, some church visible upon the earth. *Hooker.*

Men know by this time, if *ever* they will know, whether it be good or evil which hath been so long retained. *Id.*

We are in God through the knowledge which is had of us, and the love which is born towards us, from *everlasting*. *Id.*

In that he is man, he received light from the Father, as from the fountain of that *everliving* Deity. *Id.*

I see things may serve long, but not serve *ever*. *Shakspeare.*

Riches endless is as poor as Winter,
To him that *ever* fears he shall be poor. *Id.*

If thou hast that, which I have greater reason to believe now than *ever*, I mean valour, this might shew it. *Id.*

That *ever* this fellow should have fewer words than a parrot, and yet the son of a woman. *Id.*

I am old, I am old.
—I love thee better than I love *e'er* a scurvy young boy of them all. *Id. Henry IV.*

Whether we shall meet again I know not;
Therefore our *everlasting* farewell take:
For *ever*, and for *ever*, farewell, Cassius. *Shakspeare.*

I'll hate him *everlastingly*,
That bids me be of comfort any more. *Id.*

Our souls, piercing through the impurity of flesh, behold the highest heavens, and thence bring knowledge to contemplate the *everduring* glory and termless joy. *Raleigh.*

God's justice in the one, and his goodness in the other, is exercised for evermore, as the *everliving* subjects of his reward and punishment. *Id.*

You serve a master who is as free from the envy of friends, as *ever* any king was. *Bacon.*

Sparks by nature *evermore* aspire,
Which makes them now to such a highness flee. *Davies.*

Nothing could make me sooner to confess,
That this world had an *everlastingness*,
Than to consider that a year is run
Since both this lower world's and the sun's sun,
Did set. *Donne.*

Panting murmurs, stilled out of her breast,
That *everbubbling* spring. *Crashaw.*

The *everlasting* life, both of body and soul, in that future state, whether in bliss or woe, hath been added. *Hammond.*

Let no man fear that harmful creature *ever* the less, because he sees the apostle safe from that poison. *Hall.*

God is the great eye of the world, always watching over our actions, and has an *everopen* ear to all our words. *Taylor.*

There under ebon shades, and low-browed rocks
In dark Cimmerian desart *ever* dwell. *Milton.*

Torture without end
Still urges, and a fiery deluge, fed
With *everburning* sulphur unconsumed. *Id.*

Heaven opened wide
Her *everduring* gates, harmonious sound!
On golden hinges moving. *Id. Paradise Lost.*

There will I build him
A monument, and plant it round with shade
Of laurel, *evergreen*, and branching palm. *Milton.*

Some of the hardiest *evergreens* may be transplanted, especially if the weather be moist and temperate. *Evelyn.*

So few translations deserve praise, that I scarcely *ever* saw any which deserved pardon. *Denham.*

And what a trifle is a moment's breath,
Laid in the scale with *everlasting* death! *Id.*

The *everpleasing* Pamela was content to urge a little farther for me. *Sidney.*

The most sensual man that *ever* was in the world never felt so delicious a pleasure as a clear conscience. *Tillotson.*

Religion prefers those pleasures which flow from the presence of God for *evermore*, infinitely before the transitory pleasures of this world. *Id.*

I know a lord, who values no lease, though for a thousand years, nor any estate that is not *for ever* and ever. *Temple.*

The inclinations of the people must *ever* have a great influence. *Id.*

He shall *ever* love, and always be
The subject of my scorn and cruelty. *Dryden.*

He lay stretched along,
And *ever* and anon a silent tear
Stole down and trickled from his hoary beard. *Id.*

That purse in your hand has a twin-brother, as like him as *ever* he can look. *Id. Spanish Friar.*

The fat ones would be *ever* and anon making sport with the lean, and calling them starvelings. *L'Estrange.*

By repeating any idea of any length of time, as of a minute, a year, or an age, as often as we will in our own thoughts, and adding them to one another, without *ever* coming to the end of such addition, we come by the idea of eternity. *Locke.*

It suffices to the unity of any idea, that it be considered as one representation or picture, though made up of *ever* so many particulars. *Id.*

Men are like a company of poor insects, whereof some are bees, delighted with flowers and their sweetness; others beetes, delighted with other kinds of viands; which, having enjoyed for a season, they be, and exist no more *for ever*. *Id.*

since that time Lisander has been at the house. *Tatler.*

The title of duke had been sunk in the family *ever* since the attainder of the great duke of Suffolk. *Addison on Italy.*

I find you are against filling an English garden with *evergreens*. *Id. Spectator.*

As soon as *ever* the bird is dead,
Opening again, he lays his claim
To half the profit, half the fame. *Prior.*

For a mine undiscovered, neither the owner of the ground or any body else are *ever* the richer. *Collier.*

The instinct of brutes and insects can be the effect of nothing else than the wisdom and skill of a powerful *everliving* agent. *Newton.*

We'll to the temple: there you'll find your son;
And there be crowned, or give him up *for ever*. *A. Philips.*

The juice, when in greater plenty than can be exhaled by the sun, renders the plant *evergreen*. *Arbuthnot on Aliments.*

There must be somewhere such a rank as man:
And all the question, wrangle *e'er* so long,
Is only this, If God has placed him wrong? *Pope.*

Immortal Vida! on whose honoured brow
The poet bays and critick's ivy grow,
Cremona now shall *ever* boast thy name,
As next in place to Mantua, next in fame. *Id.*

The meeting points the fatal lock dissever
From the fair head, *for ever* and *for ever*. *Id.*

Forsaking Sheria's *everpleasing* shore,
The winds to Marathon the virgin bore. *Id.*

Placed at the helm he sat, and marked the skies
Nor closed in sleep his *everwatchful* eyes. *Id.*

Mentes, an *everhonoured* name, of old
High in Ulysses' social list enrolled. *Id. Odyssey.*

Joys *everyoung*, unmixed with pain or fear,
Fill the wide circle of the eternal year. *Id.*

Many have made themselves *everlastingly* ridiculous. *Swift.*

His boundless years can ne'er decrease,
But still maintain their prime,
Eternity's his dwelling place,
And *ever* is his time. *Watts.*

Thy throne eternal ages stood,
Ere seas or stars were made;
Thou art the *ever-living* God,
Were all the nations dead. *Id.*

Refined policy *ever* has been the parent of confusion; and *ever* will be so, as long as the world endures. *Burke.*

In the compartment there are two trees, whose branches spread over the figures; one of them has smoother leaves like some *evergreens*, and might thence be supposed to have some allusion to immortality, but they may perhaps have been designed only as ornaments. *Darwin.*

'Tis true your asses and your apes,
And other brutes in human shapes,
And that thing made of sound and show
Which mortals have misnamed a beau,
(But in the language of the sky
Is called a two-legged butterfly),
Will make your very heartstrings ache
With loud and *everlasting* clack. *Beattie.*

To what recess
Shall we our weary steps address,
Since Fate is *evermore* pursuing
All ways and means to work our ruin? *Id.*

The sight of Christ in glory, with his saints will, in an inexpressible manner, torment the crucifiers of the one and the persecutors of the others; as it will shew them the hopes and wishes of their adversaries all granted to the full, and all their own 'desires' and designs for *ever* at an end.
*Bishop Horne. Commentary on Psalm* cxii.

One spot exists, which *ever* blooms,
Even in that deadly grove—
A single rose is shedding there
Its lonely lustre, meek and pale. *Byron.*

Evergreens are a species of perennials, such as hollies, phillyreas, laurustinuses, bays, pines, firs, cedars of Lebanon, &c. They preserve their old leaves a long time after the formation of the new, and do not drop them at any determinate time. In general, the leaves of evergreens are harder, and less succulent, than those which are renewed annually. The trees are generally natives of warm climates; as the alaternuses of France and Italy, the evergreen oak of Portugal and Suabia, &c. Some herbaceous perennials, as the house-leeks and navel-worts, enjoy the same privilege with the evergreen trees, and resist the severities of winter; some can even exist out of the earth for some time; being replete with juices, which the leaves imbibe from the humidity of the atmosphere, and, which, in such plants, are of themselves sufficient for effecting the purposes of vegetation. For this reason, unless in excessive hot weather, gardeners seldom water fat succulent plants, as the aloes, which rot when they are moistened, if the sun does not quickly dry them. The leaves of all the evergreen shrubs and trees have a thin compact skin over their surface, as is easily discovered by macerating them in water, to separate the parenchyma, or pulp, from the vessels of the leaves; which cannot be effected in any of these evergreens till a thin parchment-like cover is taken off. They are found by experiment to perspire but little, when compared with those which shed their leaves; and it is, perhaps, principally owing to this close covering, that they retain their verdure, and continue through the winter on the trees. The nutritive juices of these plants always abound, more or less, with an oily quality, which secures them from being injured by severe frost; so that many evergreens grow in the coldest parts of the habitable world.

Everlasting Pea. See Lathyrus.

EUERGETES, Gr. ευεργετης, i.e. a benefactor, a surname given to Philip III. of Macedonia, Antigonus Doson, and Ptolemy III. of Egypt. It was also assumed by the monster Ptolemy Physcon, as well as by some of the kings of Syria and Pontus, particularly Alexander Balas and Mithridates. Some of the Roman emperors also claimed this epithet, though most of them rather merited that of κακοεργετης, malefactor.

EVERO, the name of a mountain of South America, in Peru, and of a late village near it. During the great earthquake in February 1797 (see Peru) the mountain fell on the village, and totally overwhelmed it, without leaving a single soul alive.

EVERSE', *v. a.* } Old Fr. *evertir*; Lat. *everto*, *eversus*, *e* and *verto*, to turn over. To overthrow, subvert, destroy.
EVER'SION, *n. s.*
EVERT', *v. a.*

Supposing overturnings of their old error to be the *eversion* of their well established governments. *Bp. Taylor.*

The foundation of this principle is totally *eversed* by the ingenious commentator upon immaterial beings. *Glanville.*

A process is valid, if the jurisdiction of the judge is not yet *everted* and overthrown. *Ayliffe.*

EV'ERY, *adj.* } Dr. Johnson says anciently *everich* or *ever each*; but Mr. Thomson derives it from Goth. *a* one, and *vera* to be; the first meaning of the word being each. 'Everich' and 'everyche,' however, abound in our early writers. See the examples. Each one of two or more; every day is common to all days; every where in all places, in each place.
EV'ERY-DAY, *adj.*
EV'ERYWHERE,

And so whanne thei weren come, that camen aboute the elleventhe hour also thei token *everich* of hem a peny. *Wiclif. Matt.* 20.

All the congregation are holy, *every* one of them. *Numb.* xvi.

If that you liketh, take it for the beste,
That *everich* of you shal gon wher him leste
Freely withouten raunsom or dangere.
*Chaucer. Cant. Tales.*

Nathelesse handes of some men hadden kerve that clothe, by violence or by strength, and *everiche* manne of 'hem had borne awaie soche peces, as he might getten. *Colevile.*

He proposeth unto God their necessities, and they their own requests for relief in *every* of them. *Hooker.*

The substance of the body of Christ was not *everywhere* seen, nor did it *every-where* suffer death; *everywhere* it could not be entombed: it is not *every-where* now, being exalted into heaven. *Id.*

The king made this ordinance, that *every* twelve years there should be set forth two ships. *Bacon.*

The virtue and force of *every* of these three is shrewdly allayed. *Hammond's Fundamentals.*

Now Pharaoh must need see how impotent a devil he served, that could not make that vermin which *every-day* rises voluntarily out of corruption.
*Bp. Hall's Contemplations.*

*Every* man is not a proper champion for truth, not fit to take up the gauntlet in the cause of verity.
*Sir T. Browne.*

Aristotle has long since observed, how unreasonable it is to expect the same kind of proof for *every* thing, which we have for some things. *Tillotson.*

I saw you *every* day and all the day,
And *every* day was still the same. *Dryden.*

*Every* one, that has an idea of a foot, finds that he can repeat that idea, and, joining it to the former, make the idea of two feet. *Locke.*

If I send my son abroad, how is it possible to keep him from vice, which is *every-where* so in fashion?
*Id.*

*Every* compliance that we are persuaded to by one, is a contradiction to the commands of the other; and our adherence to one, will necessarily involve us in a desertion of the other. *Rogers.*

From pole to pole the thunder roars aloud,
And broken lightnings flash from *every* cloud.
*Pope.*

This was no *every-day* writer. *Id.*

'Tis no where to be found, or *every-where*. *Id.*

Years of maturity were not always accompanied with discretion, neither was youth in *every* instance devoid of it. *Franklin.*

Ah, not like her who, half afraid, half bold,
Proud of new slaves, yet loath to lose the old,
When cruel fortune gathers round her throne
Whom singly she had seemed to love alone,
Must anxious manage *every* look and speech,
And deal the cautious tenderness to each.
*Dr. T. Brown.*

EVES-DROPPER, more properly written EAVES-DROPPER, which see.

What makes you listen there? Get farther off;
I preach not to thee, thou wicked *evesdropper*.
*Dryden's Spanish Fryar.*

Do but think how becoming your function it is to be disguised like a slave, and an *evesdropper*, under the women's windows. *Id. Don Sebast.*

EVESHAM, or EVESHOLM, commonly called Esam, a borough of Worcestershire, seated on a gentle ascent from the river Avon, over which there is a stone bridge of seven arches. It sends two members to parliament, and had formerly an abbey, which was one of the largest in the kingdom, whose abbot sat in parliament as a spiritual lord. It was founded in 709 by prince Egwin, who retired thither after he had been unjustly dispossessed of the bishopric of Worcester by the pope. The principal fragment of this building, now remaining, is a large, elliptical arch, or gateway, seventeen feet high. King James I. gave this town a charter for a mayor, seven aldermen, twelve burgesses, a recorder and chamberlain, who are all of the common council, with twenty-four assistants. The mayor and four of the aldermen are justices of the peace, and of oyer and terminer, &c., for all offences in the corporation, except high treason; and the corporation has power to try and execute felons within the borough. It has three churches, but the bells of two of them have been removed to a beautiful old tower, which was one of the gates of the abbey. It has a weekly market and four fairs; and lies fourteen miles south-east of Worcester, and 100 north-west by west of London.

EVESHAM, VALE OF, a spacious valley in Worcestershire, on the banks of the Avon, celebrated for its fertility and beauty. Besides the usual objects of agriculture, great quantities of garden stuff are cultivated, and sent to the towns around to a considerable distance. In this vale, Simon de Montfort, earl of Leicester, was defeated and slain by prince Edward in 1265, the very year in which, by his usurped authority, the house of commons first received its existence. See ENGLAND. This vale, communicating with the more extensive and spacious one on both sides of the Severn, gives to it, for no assignable reason, the same general name of the Vale of Evesham. See SEVERN.

EUGANO, or the EUGANEAN MOUNTAINS, a chain of hills in Upper Italy, between Este and Padua, and sometimes considered as a branch of the Noric Alps. They furnish many petrifactions of shell-fish. The highest point, Mount Venda, is about 1800 feet above the level of the sea.

EUGENE (Francis), prince of Savoy, descended from Carignan, one of the three branches of the house of Savoy, and son of Eugene Maurice, general of the Swiss and Grisons, governor of Champagne, and earl of Soissons, was born in 1663. Louis XIV. thought him so much addicted to pleasure, that he refused him preferment both in church and state. Prince Eugene, in disgust, quitted France; and, returning to Vienna, devoted himself to the imperial service. In 1691 he was sent into Piedmont, where he relieved Coni, which the French had besieged, and took Carmagniola. But the war between the emperor Leopold I. and the Turks afforded more ample opportunity of exerting his military talents; and every campaign proved a new step to his advancement to the highest offices in the army. Having attained to the chief command in 1697, he that year gave the Turks a memorable defeat at Zenta. Upon the death of Charles II. of Spain, the emperor laid claim to the throne, which occasioned a new war; and prince Eugene was sent into Italy, where he defeated the celebrated French general Catinat, and obliged him to retreat. Marshal Villeroy succeeded Catinat, but he was still less successful against the prince, who foiled him in every engagement; and while the marshal lay at Cremona, secure, as he supposed, the prince entered the place by stratagem, and took him prisoner. Not long after this, the prince returned to Vienna, where he was made president of the council, and associated with the great duke of Marlborough in the command of the allied army. History scarcely affords a parallel to this association; they were two of the greatest generals of the age, equal in their merit and fame, as well for their courage and conduct in military exploits, as their prudence in council. From their first meeting, at Helibron, their esteem grew into friendship and confidence, and contributed to the glorious successes which attended the arms of the allies during the war. Prince Eugene had a principal share in the famous

battle at Blenheim in 1704; and though he next year suffered a repulse from Vendome, in Cassano, he quickly retrieved this reverse by a bloody action near Turin, which was then besieged by the French, whose trenches he forced, and gained a complete victory. In 1707 he entered France, and laid siege to Toulon, but was not able to reduce it. The next year he commanded the imperial army in Flanders, and contributed to the victory at Oudenarde. In 1709 he had a considerable share in the hard won victory at Malplaquet, where he received a slight wound in the head. In 1712 he came over to England, in order, if possible, to prevent the English ministry from making a separate peace, but his arguments were ineffectual, and he was left to finish the war alone. This defection soon obliged him to enter into a negociation with marshal Villars, which produced the peace of Rastadt in 1714. This peace was scarcely concluded, when a war broke out between the emperor and the Turks, on which the prince was again entrusted with the command in Hungary, where, in 1716, he defeated the grand vizier at Peterwaradin, which he followed up by capturing Belgrade. After the peace of 1718 he retired to a private life; but in 1733, when the election for the crown of Poland was disputed, he was again employed. His service, however, was short, and unproductive of any remarkable action. He died at Vienna in 1736, and was as remarkable for his modesty and liberality, as for his abilities in the cabinet and the field.

EUGENIA, the yamboo, a genus of the monogynia order and icosandria class of plants; natural order nineteenth, hesperideæ: CAL. quadripartite, superior; the petals four, the fruit a monospermous quadrangular plum. There are two species, natives of the hot parts of Asia. They rise from twenty to thirty feet high, and bear plum-shaped fruit, enclosing one nut. They are too tender to live in this country, unless they are constantly kept in a stove.

EUGH, or Ew, *n. s.* Eughen, *adj.* } Saxon, ıþ; Welsh, *iw*, or *ywen*; Tartar, *iay*; Teut. *eib*; Belg. *iven*, Fr. *if*. The original mode of spelling the word now written Yew, which see. Eughen is, made of yew.

And eke the names how the trees highte,
As oke, fir, birch, ashe, alder, holm, poplere,
Maple, thorn, beche, hasel, *ew*, whipultre,
How they were feld, shall not be told for me.
*Chaucer.*

His stiff arms to stretch with *eughen* bow,
And many legs still passing to and fro.
*Hubbard's Tale.*

The shooter *eugh*, the broad-leaved sycamore,
The barren plantane, and the walnut sound;
The myrrhe, that her foul sin doth still deplore;
Alder, the owner of all waterish ground. *Fairfax.*

At the first stretch of both his hands he drew,
And almost joined the horns of the tough *eugh*.
*Dryden's Æneid.*

EVICT', *v. a.* Evict'ion, *n. s.* } Fr. *evincer*; Lat. *evincere*, *evictus*; from *e* and *vinco*, to conquer. To take from or dispossess by force of law; and, in an obsolete sense, to prove, evince.

If any of the parties be laid asleep under pretence of arbitrement, and the other party doth cautiously get the start at common law, yet the pretorian court will set back all things, and no respect had to *eviction* or dispossession. *Bacon.*

His lands were *evicted* from him. *K. James.*

The law of England would speedily *evict* them out of their possession, and therefore they held it the best policy to cast off the yoke of English law.
*Davies on Ireland.*

A plurality of voices carries the question, in all our debates, but rather as an expedient for peace than an *eviction* of the right. *L'Estrange.*

This nervous fluid has never been discovered live animals by the senses, however assisted; nor its necessity *evicted* by any cogent experiment. *Cheyne.*

EV'IDENCE, *n, s.* & *v. a.* Ev'ident, *adj.* Eviden'tial, Ev'idently, *adv.* } Fr. *evidence*; Italian, *evidenza*; Latin, *evidentia*; *evidens*, from *video*, Ionic ιδεω, and the digamma being prefixed Fιδεω, to see. Certainty, or certain testimony, proof: hence witness, and one who gives witness proof. As a verb, to evidence means to prove; make clear or apparent. Evidential, affording proof. Evident and evidently mean, clear; obvious; plainly; obviously

I had delivered the *evidence* of the purchase unto Baruch. *Jer.*

Lytel Lowys my sonne, I perceive well by certaine *evidences*, thine abylyte to lerne scyences. *Chaucer.*

It is, and may be made *evident* enough, that the greatest infirmities and deformities of the mind may be reformed and rectified by industry and reasonable application. *Clarendon.*

Thou on earth had'st prospered, which thy looks
Now also *evidence*. *Milton's Par. Lost.*

It is *evident*, in the general frame of nature, that things most manifest unto sense have proved obscure unto the understanding. *Browne's Vulgar Errours.*

Although the same truths be elicited and explicated by the contemplation of animals, yet they are more clearly *evidenced* in the contemplation of man.
*Hale's Origin of Man.*

These things the Christian religion requires, as might be *evidenced* from taxes. *Tillotson.*

The horses must be *evidenced* by good testimonies to have been bred in Ireland. *Temple.*

They are incapable of making conquests upon their neighbours, which is *evident* to all that know their constitutions. *Id.*

To swear he saw three inches through a door,
As Asiatick *evidences* swore. *Dryden's Juvenal.*

Children minded not what was said, when it was *evident* to them that no attention was sufficient.
*Locke.*

It being as impossible that the love of truth should carry my assent above the *evidence* there is to me that it is true, as that the love of truth should make me assent to any proposition, for the sake of that *evidence*, which it has not, that it is true; which is, in effect, to love it as a truth, because it is possible or probable that it may not be true. *Locke.*

They bear *evidence* to a history in defence of Christianity, the truth of which history was their motive to embrace Christianity. *Addison.*

Laying their eggs, they *evidently* prove
The genial power and full effects of love. *Prior.*

There are books extant, which they must needs allow of as proper *evidence*; even the mighty volumes of visible nature, and the everlasting tables of right reason. *Bentley.*

The printing private letters is the worst sort of betraying conversation, as it *evidently* has the most extensive ill consequences. *Pope.*

Remember you sit in judgment upon yourself, and have nothing to do at present but to sift the *evidence*, which conscience may bring in. *Mason.*

It appears *evident* that frugality is necessary even to complete the pleasure of expense. *Johnson.*

But in all cases where such accounts are entitled to credit, or supported by tolerable *evidence*, it will be found that they referred to something which it concerned men to know; the overthrow of kingdoms, the death of great persons, the detection of atrocious crimes, or the preservation of important lives. *Beattie.*

His *evidence*, if he were called by law
To swear to some enormity he saw,
For want of prominence and just relief,
Would hang an honest man, and save a thief. *Cowper.*

The ship was *evidently* settling now
Fast by the head; and, all distinction gone,
Some went to prayers again, and made a vow
Of candles to their saints—but there were none
To pay them with. *Byron.*

E'VIL, *n. s.*, *adj.* & *adv.*
E'VIL-AFFECTED, *adj.*
E'VIL-DOER, *n. s.*
E'VIL-EYED, *adj.*
E'VIL-FAVORED,
E'VIL-FAVOREDNESS, *n. s.*
E'VILLY, *adv.*
E'VIL-MINDED, *adj.*
E'VIL-MINDEDNESS, *n. s.*
E'VIL-SPEAKING, *n. s.*
E'VIL-WORKING, *adj.*
E'VIL-WORKER, *n. s.*

Saxon, ẏpel; Gothic, *uwel.* or *ubils*; Teut. *ubels*; Belg. *euvel*, from *u* negative, and *vel*, right or well; or, as Minsheu not improbably conjectures, from Heb. הבל, vanity; destitute of good or truth.—Crime; falsehood; wickedness; injury; mischief, calamity: as an adjective, having bad or injurious qualities, moral or physical; mischievous; unhappy; miserable: as an adverb, not well in whatever respect; not happy, or tending to happiness. The compounds follow these meanings.

Ech man that doith *yuel* hatith the lyght, and he cometh not to the lyght, that hise werkis be not repreued. *Wiclif. Jon.* 3.

The imagination of man's heart is *evil* from his youth. *Gen.*

It is my son's coat; an *evil* beast hath devoured him. *Id.*

He hath brought up an *evil* name upon a virgin. *Deut.*

The Egyptians *evil* entreated us, and afflicted us. *Id.*

Thou shalt not sacrifice unto the Lord any bullock or sheep, wherein is blemish, or any *evilfavouredness.* *Id.*

The good figs very good, and the *evil* very *evil*, that cannot be eaten they are so *evil* *Jeremiah.*

The unbelieving Jews stirred up the Gentiles, and made their minds *evil-affected* against the brethren. *Acts.*

Whereas they speak *evil* against you as *evildoers*, they may by your good works glorify God. *Peter.*

Wherefore laying aside all malice and all guile, and hypocrisies and envies, and all *evilspeakings.* *Id.*

Beware of dogs, beware of *evilworkers.* *Phil.*

When there was none,
But they alone,
The frere with *euyll* grace,
Sayd, I rest the,
Come on with me,
And out he toke his mace. *Sir. T. More.*

To forsake the true God of heaven, is to fall into all such *evils* upon the face of the earth, as men, either destitute of grace divine, may commit, or unprotected from above, may endure. *Hooker.*

The just, though they hate *evil*, yet give men a patient hearing; hoping that they will shew proofs that they are not *evil.* *Sir P. Sidney.*

No man, because he hath done well before, shall have his present *evils* spared;—reward is proper to well-doing; punishment to *evil-doing*; which must not be compounded no more than good and *evil* are to be mingled. *Id.*

Not in the legions
Of horrid hell can come a devil more damned
In *evils* to top Macbeth! *Shakspeare. Macbeth.*
What's the disease he means?
—'Tis called the *evil.* *Id*
This act so *evilly* born, shall cool the hearts
Of all his people, and freeze up their zeal. *Shakspeare.*

achiavel well noteth, though in an *evilfavoured* instance, there is no trusting to the force of nature, it be corroborated by custom. *Bacon's Essays.*

fection of *evil* is much worse than the act. *Bp. Hall's Contemplations.*

asure's the hook of *evil*; case of care,
And so the general object of the court;
Yet some delights are lawful. *Massinger.*

The moral goodness and congruity, or *evilness*, unfitness, and unseasonbleness of moral or natural actions, fall not within the verge of a brutal faculty. *Hale's Origin of Mankind.*

They heard of this sudden going out, in a country full of *evil-wishing* minds towards him. *Sidney.*

But most she feared, travelling so late,
Some *evilminded* beasts might lie in wait,
And, without witness, wreak their hidden hate. *Dryden.*

If we will stand boggling at imaginary *evils*, let us never blame a horse for starting at a shadow. *L'Estrange.*

*Evil* is what is apt to produce or increase any pain, or diminish any pleasure in us; or else to procure us any *evil*, or deprive us of any good. *Locke.*

It is one thing to submit to heaven, as a lesser *evil* than hell; and another to desire it as a greater good than earth. *Baxter.*

He that calls a man ungrateful, sums up all the *evil* that a man can be guilty of. *Swift.*

However, look not unequally either at the good or *evil* that is in you; but view them as they are. *Mason.*

EVIL-MERODACH, king of Babylon, succeeded his father Nebuchadnezzar the Great, A. M. 3443. He had governed the kingdom during the lunacy of his father, who after seven years, having recovered his understanding, once more ascended the throne, and imprisoned his son Evil-Merodach. In this confinement, it is supposed, that Evil-Merodach made an acquaintance and friendship with Jeconiah, king of Judah, who had been carried to Babylon by Nebuchadnezzar. However, it is certain, that soon after his succession to the throne, he delivered the king of Judah out of prison, after a confinement of thirty-seven years, heaped many favors on him, and placed him above all the other kings

who were at the court of Babylon (2 Kings xxv. 27; Jer. lii. 31). Evil-Merodach reigned but one year, according to the chronology of archbishop Usher; but Dr. Prideaux says, he reigned two years, and was succeeded by Neriglissar, his sister Nitocris's husband, who, having been at the head of a conspiracy that put him to death, reigned in his stead. Others will have it, that this prince was immediately succeeded by his son Belshazzar.

EVINCE', *v. a.* & *v. n.* } Fr. *evincer;* Lat. *evinco,* to prove: from *vinco,* to prevail, either in argument or battle. To conquer (rarely used); to prove; show; make manifest. Evincible, is capable of proof.
EVINC'IBLE, *adj.*
EVINC'IBLY, *adv.*

The witness *evinceth,* the judge sentences. *Bp. Hall.*

Doubt not but that sin
Will reign among them as of thee begot;
And therefore was law given them, to *evince*
Their natural pravity. *Milton's Paradise Lost.*

Implanted instincts in brutes are in themselves highly reasonable and useful to their ends, and e *cible* by true reason to be such. *Ha*

That religion, teaching a future state of souls, probability; and that its contrary cannot, with al probability, be proved, we have *evinced.*

The greater absurdities are, the more stro do they *evince* the falsity of that supposition from nce they flow. *Att ry.*

E'VIRATE, *v. a.* Lat. *eviratus.* To deprive of manhood; to emasculate.

EVI'SCERATE, *v. a.* Lat. *eviscer .* To embowel; to draw; to deprive of the entrails; to search within the entrails.

EV'ITATE, *v. a.* & *adj.* } Fr. *eviter;* Latin, *evito;* from *vito,* to avoid. Both verbs signify to avoid; to shun; escape. Evitable is avoidable; that which may be shunned or escaped from.
EV'ITABLE, *adj.*
EVITA'TION, *n. s.*
EVITE', *v. a.*

Of divers things evil, all being not *evitable,* we take one; which one, saving only in case of so great urgency, were not otherwise to be taken. *Hooker.*

Therein she doth *evitate* and shun
A thousand irreligious cursed hours,
Which forced marriage would have brought upon her. *Shakspeare.*

In all bodies there is an appetite of union, and *evitation* of solution of continuity. *Bacon.*

EVITE'RNAL, *adj.* } Lat. *æviternus.* Eternal in a limited sense; duration not infinitely but indefinitely long.
EVITERNAL'ITY, *n. s.*

Have not I lands of faire inheritance,
Derived by right of long continuance,
To first-borne males, so list the law to grace,
Nature's first fruits in *eviternal* race? *Bp. Hall.*

EULER (Leonard), F. R. S., was born at Basil, April 15th, 1707. He was the son of Paul Euler and Margaret Brucker, of an illustrious family; and spent the years of his infancy in a rural retreat at the village of Richen, where his father was minister. He was afterwards sent to the university of Basil, where all his leisure time was consecrated to geometry, which soon became his favorite science. The early progress he made in this study, added fresh ardor to his application; and thus he obtained the esteem of professor John Bernouilli, who was then one of the first mathematicians in Europe. In 1723 M. Euler took his degree as M. A., when he delivered a Latin discourse, in which he drew a comparison between the philosophy of Newton and Des Cartes, which was received with the greatest applause. While under the instructions of M. Bernouilli, he contracted an intimate friendship with his two sons Nicholas and Daniel; and it was chiefly in consequence of this that he became afterwards the principal ornament of the academy of Petersburg. The project of erecting this academy, formed by Peter the Great, was executed by Catharine I.: and the two young Bernouillis, being invited to Petersburg in 1725, promised Euler that they would use their utmost endeavors to procure for him an advantageous settlement in that city. In the mean time, by their advice, he applied himself with ardor to the study of physiology, to which he made an application of his mathematical knowledge; in a Dissertation on the Nature and Propagation of Sound, and an answer to a prize question concerning the masting of ships; to which the Academy of Sciences adjudged the accessit or second rank, in 1727. Soon after this he was called to Petersburg, and was made joint professor with his countrymen Hermann and Daniel Bernouilli in the university of that city. At this time he carried to new degrees of perfection the integral calculus, and he invented the calculation by sines, thus throwing new light on all the parts of mathematical science. In 1730 he was promoted to the professorship of natural philosophy; and in 1733 he succeeded his friend D. Bernouilli in the mathematical chair. In 1735 a problem was proposed by the Academy, for the solution of which several eminent mathematicians had demanded some months. The problem was solved by Euler in three days, to the great astonishment of the Academy; but the violent and laborious efforts it cost him threw him into a fever, which endangered his life, and deprived him of the use of his right eye. The Academy of Sciences at Paris, which in 1738 had adjudged the prize to his memoir Concerning the Nature and Properties of Fire, proposed for the year 1740 the important subject of the tides; a problem whose solution required the most arduous calculations. Euler's treatise on this question was adjudged a master-piece of analysis and geometry; and it was more honorable for him to share the academical prize with such illustrious competitors as Colin Maclaurin and Daniel Bernouilli, than to have carried it away from rivals of less magnitude. Seldom if ever did such a brilliant competition adorn the annals of the Academy; and perhaps no subject, proposed by that learned body, was ever treated with such accuracy of investigation and force of genius, as that which here displayed the philosophical powers of this extraordinary triumvirate. In 1741 M. Euler was invited by Frederic II. to Berlin, to direct and assist the Academy then rising into fame. He enriched the last volume of the Miscellanies (Melanges) of Berlin with five memoirs, which form an eminent figure in that collection. These were followed with amazing rapidity, by a number of important researches, which are dispersed

through the Memoirs of the Prussian Academy; a volume of which has been regularly published every year since its establishment in 1744. Of these we shall only mention a few: his complete Treatise of Isoperimetrical Curves; his Theory of the Motions of the Planets and Comets; his Theory of Magnetism, which gained the Paris prize, and his much amended translation of Robins's Treatise on Gunnery, were all published in 1744. In 1746 his Theory of Light and Colors overturned Newton's System of Emanations; as it did another work, then triumphant, the Monads of Wolfe and Leibnitz. And as navigation was the only branch of useful knowledge, for which the labors of analysis and geometry had done nothing, Euler began now to turn his attention to this science. A memoir on the motion of floating bodies, by M. le Croix, gave him the first idea. His researches on the equilibrium of ships furnished him with the means of bringing stability to a determined measure, and produced the great work, which the Academy published in 1749, in which we find, in systematic order, the theory of the equilibrium and motion of floating bodies. This was followed by a second part: and, in 1773, produced the Theorie complette de la Construction et de la Manœuvre des Vaisseaux. This work was instantly translated into all languages, and the author received a present of 6000 livres from the French king. He had before had £300 from the English parliament, for the theorems by the assistance of which Meyer made his lunar tables. It was now time to collect, into one systematical and continued work, all the important discoveries on the infinitesimal analysis which Euler had been making for thirty years, and which lay dispersed in the memoirs of the different Academies. This, accordingly, our professor set about; but he prepared the way by an elementary work, containing all the previous requisites for this study. This is called an Introduction to the Analysis of Infinitesimals; and is a work in which the author has exhausted all the doctrine of fluxions, whether algebraical or transcendental, by showing their transformation, resolution, and development. The labors of Euler appear the more astonishing, that while he was enriching the academy of Berlin with a number of memoirs on the deepest parts of mathematical science, containing always some new points of view, and sometimes discoveries of great importance, he still continued his philosophical contributions to the Academy of Petersburg, which granted him a pension in 1742, and whose Memoirs display the marvellous fecundity of Euler's genius. It was with much difficulty that this great man obtained, in 1766, permission from the king of Prussia to return to Petersburg, where he desired to pass the rest of his days. Soon after his return he was rewarded by Catharine II., but was seized with a violent disorder, which ended in he total loss of his sight. A cataract, formed in his left eye, which had been essentially damaged by too ardent application to study, deprived him entirely of the use of that organ. It was in this distressing situation he dictated to his servant, a taylor's apprentice, who was absolutely devoid of mathematical knowledge, his Elements of Algebra; which, by their intrinsical merit, in point of perspicuity and method, and the unhappy circumstances in which they were composed, have equally excited applause and astonishment. This work, though purely elementary, discovers proofs of a most inventive genius; and it is here alone that we meet with a complete theory of the analysis of Diophantus. About this time M. Euler was honored by the Academy of Sciences at Paris with the place of one of its foreign members; and the academical prize was adjudged to three of his memoirs, Concerning the Inequalities in the Motions of the Planets. The two prize questions, proposed by the same academy for 1770 and 1772, were designed to obtain from the labors of astronomers a more perfect theory of the moon. M. Euler, assisted by his eldest son, was a competitor for these prizes, and obtained them both. He afterwards reviewed his whole theory, with the assistance of son and Messrs. Krafft and Lexell, and pur-ed his researches until he had constructed the n w tables, which appeared, together with the g at work, in 1772. Instead of confining himse as before, to the fruitless integration of ifferential equations of the second degree, re furnished by mathematical principles, ced them to the three ordinates, which me the place of the moon; he divided sses all the inequalities of that planet, as hey depend either on the elongation of and moon, or upon the eccentricity, or the pa llax, or the inclination of the lunar orbit. All the e means of investigation, employed with such ar and dexterity as could only be expected from a nalytical genius of the first rank, were attende with the greatest success; and it is impossibl to observe, without admiration, such immense calculations on the one hand, and on the other the ingenious methods employed by this great man to abridge them, and to facilitate their application to the real motion of the moon.

Some time after this the famous oculist, Wentzell, by couching the cataract, restored his sight; but the joy that this operation produced was of short duration. Some negligence on the part of his surgeons, and his own impatience to use an organ whose cure was not completed, deprived him of his sight a second time, and this relapse was accompanied with tormenting pain He, however, with the assistance of his sons, and of Messrs. Krafft and Lexell, continued his labors; neither the loss of his sight, nor the infirmities of an advanced age, could depress the ardor of his genius. He had engaged to furnish the Academy of Petersburgh with as many memoirs as would be sufficient to complete its acts for twenty years after his death. In seven years he transmitted to the academy, by Mr. Golofkin above seventy memoirs, and above 250 more, left behind him, were revised and completed by a friend. Such of these memoirs as were of ancient date were separated from the rest, and form a collection that was published in 1783, under the title of Analytical Works. Several attacks of the vertigo, in September, 1783 (which however did not prevent his calculating the motions of the aërostatic globes), were the forerun-

ners of his death. While he was amusing himself at tea with one of his grand-children, he was struck with an apoplexy, which terminated his illustrious career at the age of seventy-six. His constitution was uncommonly strong and vigorous; his health was good; and the evening of his life was calm and serene, sweetened by the fame that follows genius, and the public respect that is paid to exemplary virtue. His works are so numerous that the printed catalogue alone extends to fifty pages; fourteen of which contain those in MS.: those printed are to be found in the Petersburg, Paris, and Berlin acts, the Acta Eruditorum, the Miscellanea Tauripensia, &c. M. Euler was twice married, and had thirteen children and thirty-eight grand-children.

EU'LOGY, *n. s.*
EU'LOGIZE, *v. a.*
EULOG'ICAL, *adj.*
EULOG'ICALLY. *adv.*
} Fr. *cloge*; Lat. *eulogia*; Gr. ευλογος, from ευ well and λογος, a discourse, Praise; encomium. To eulogise is to commend; panegyrise.

Many brave young minds have oftentimes, through hearing the praises and famous *eulogies* of worthy men, been stirred up to affect the like commendations.
*Spenser on Ireland.*

Give me leave *eulogically* to enumerate a few of those attributes. *Sir T. H[illegible].*

If some men's appetites find more melody in discord, than in the harmony of the angelic quire, yet even these seldom miss to be affected with eulogies given themselves. *Decay of Piety.*

Those
Who *eulogize* their country's foes. *Huddesford.*

EULOGY, EULOGIA, (from ευ, bene, and λεγω, dico, q. d. benedictum, blessed), a bit of consecrated bread. When the Greeks cut a loaf of bread, to consecrate it, they break the rest into little bits, and distribute them among those who have not yet communicated, or who are absent; and these pieces of bread they call eulogies. The Latin church has had something like eulogies for many ages; and thence arose the use of their holy bread. The name was likewise given to loaves or cakes brought to church by the superstitious to have them blessed. It passed hence to mere presents, without any benediction. See Gretser. de Benedict. et Maledict. lib. ii. cap. 22, &c. From a passage in Bolandus, on the life of St. Melaine, cap. 4, it appears, that eulogies were not only of bread, but any kind of meat blessed for that purpose. Almost every body blessed and distributed eulogies; hermits, though laymen, made a practice of it; women also sometimes sent eulogies. The wine sent as a present was also held an eulogy. Bolandus says, that the eucharist was also called eulogy.

EUMARIDES, of ευμαρης, easy, among the ancients, a kind of shoes common to men and women. The eumarides were used for pomp and delicacy, being neat, and painted with various colors.

EUMENES, a Greek officer in the army of Alexander, son of a charioteer; and the most worthy of all the officers of Alexander. He conquered Paphlagonia, and Cappadocia, of which he obtained the government, till the power and jealousy of Antigonus obliged him to retire. He joined his forces to those of Perdiccas, defeated Craterus and Neoptolemus, and killed the latter. When Craterus was afterwards killed, his remains received an honorable funeral from Eumenes, who, after weeping over the ashes of a man who once was his dearest friend, sent his remains to his relations in Macedonia. Eumenes fought against Antipater and conquered him; but after the death of Perdiccas, his ally, he was conquered by Antigonus, chiefly through the treachery of his officers. He then disbanded the greatest part of his army to secure a retreat; and fled with only 700 attendants to Nora, a fortified place on the confines of Cappadocia, where he was soon beseiged by the conqueror. He supported the siege for a year with courage and resolution, but some disadvantageous skirmishes so reduced him, that his soldiers, grown desperate, and bribed by the enemy, betrayed him. Antigonus hesitated whether he should not restore to his liberty a man with whom he had lived in the greatest intimacy while both were under Alexander; and these emotions of humanity were increased by the petitions of his son Demetrius. But the calls of ambition prevailed; and when Antigonus recollected what an active enemy he had in his power, he ordered Eumenes to be put to death in the prison, A. A. C. 315. Eumenes raised himself to power by merit alone. His skill in public exercises first recommended him to the notice of Philip; and under Alexander his fidelity and military accomplishments promoted him to the rank of a general. Even his enemies revered him; and Antigonus, by whose orders he perished, honored his remains with a splendid funeral, and conveyed his ashes to his wife and family in Cappadocia.

EUMENES I. king of Pergamus, succeeded his uncle Philetærus about A. A. C. 264. He made war against Antiochus the son of Seleucus, and enlarged his possessions by seizing upon many cities of the kings of Syria. He lived in alliance with the Romans, and made war against Prusias, king of Bithynia. He was a great patron of learning; but died of an excess in drinking, after a reign of twenty-two years. He was succeeded by Attalus I.

EUMENES II. succeeded his father Attalus on the throne of Asia and Pergamus. His kingdom was small and poor, but he rendered it powerful and opulent; and his alliance with the Romans contributed to the increase of his dominions after the victories obtained over Antiochus the Great. He carried his arms against Prusias and Antigonus; and died A. A. C. 160, after reigning forty years, leaving the kingdom to his son Attalus II. He has been admired for his benevolence and magnanimity; and his love of learning greatly enriched the famous library of Pergamus, which had been founded by his predecessors in imitation of the Alexandrian collection of the Ptolemies. His brothers were so attached to him, that they enlisted among his body-guards to show their fraternal fidelity.

EUMENIDES, a name given to the Furies by the ancients. See FURIES. It seems to have been given them in irony, as ευμενεια, instead of vengeance, signifies benevolence.

EUMENIDIA, festivals in honor of the Eumenides, or Furies, celebrated annually with sacrifices of pregnant ewes, with offerings of

cakes made by the most eminent youths, and libations of honey and wine. At Athens none but free-born citizens were admitted, such as had led a life the most virtuous and unsullied.

EUMOLPIDES, the priests of Ceres at the celebration of her festivals at Eleusis; the descendants of Eumolpus, king of Thrace; who being appointed priest of Ceres, by Erechtheus king of Athens, soon became so powerful, that he made war against Erechtheus himself. This war proved fatal to both. Erechtheus and Eumolpus were both killed, and peace was re-established among their descendants, on condition that the priesthood should ever remain in the family of Eumolpus, and the regal power in the house of Erechtheus. The priesthood accordingly continued in the family of the Eumolpides for 1200 years; which is the more remarkable, as he who was once appointed to the office was obliged to remain in perpetual celibacy.

EUMOLPUS, in fabulous history, a king of Thrace, son of Neptune and Chione. He was thrown into the sea by his mother, who wished to conceal her shame from his father. Neptune saved his life and carried him into Æthiopia, where he was brought up by a woman, one of whose daughters he married. An act of violence to his sister-in-law obliged him to leave Æthiopia, and he fled to Thrace with his son Ismarus, where he married the daughter of Tegyrius, the king of the country. This connexion rendered him ambitious; he conspired against his father-in-law, and fled, when the conspiracy was discovered, to Attica, where he was initiated in the mysteries of Ceres of Eleusis, and made hierophantes or high priest. He was afterwards reconciled to Tegyrius, and inherited his kingdom. He perished in battle about A. A. C. 1380. See the last article.

EUNAPIUS, a native of Sardis in Lydia, a celebrated sophist, physician, and historian, who flourished in the fourth century, under Valentinian, Valens, and Gratian. He wrote The Lives of the Philosophers and Sophists, in which he shows himself a bitter enemy to the Christians; also a history of the Cæsars, which he deduced from the reign of Claudius II., where Herodian left off, down to that of Arcadius and Honorius. The history is lost; but we have the substance of it in Zosimus, who is supposed to have done little more than copy it.

EUNOMIANS, in church history, Christian heretics in the fourth century. They were a branch of Arians, and took their name and creed from Eunomius bishop of Cyzicus; whose confession of faith here follows, extracted from Cave's Historia Literaria:—'There is one God, uncreated and without beginning; who has nothing existing before him, for nothing can exist before what is uncreate; nor with him, for what is uncreate must be one; nor in him, for God is a simple and uncompounded being. This one simple and eternal being is God, the creator and ordainer of all things: first indeed, and principally, of his only begotten son; and then, through him, of all other things. For God begot, created, and made the Son only, by his direct operation and power, before all things, and every other creature; not producing, however, any being like himself, or imparting any of his own proper substance to the Son: for God is immortal, uniform, indivisible; and therefore cannot communicate any part of his own proper substance to another. He alone is unbegotten; and it is impossible that any other being should be formed of an unbegotten substance. He did not use his own substance in begetting the Son, but his will only; nor did he beget him in the likeness of his substance, but according to his own good pleasure. He then created the Holy Spirit, the first and greatest of all spirits, by his own power indeed and operation mediately, yet by the immediate power and operation of the Son. After the Holy Spirit, he created all other things in heaven and in earth, visible and invisible, corporeal and incorporeal, mediately by himself, by the power and operation of the Son,' &c.

EUNOMIUS, a famous heresiarch of the fourth century, the disciple of Aetius (see Aetius.), ut more subtile than his master, as well as more old in propagating the opinions of his sect. e was born at Dacora, in Cappadocia, and or- ined bishop of Cyzicus; but gave so much urbance by his zeal that he was deposed more once. At last he petitioned to retreat to his place, where he died very old, about A. D. after experiencing a variety of sufferings. vorks are lost, except a few small pieces is confession of faith, which Cave inserted s Historia Literaria, from a manuscript chbishop Tennison's library. See Euno-

NUCH, *n. s.*
NUCHATE, *v. a.*
UCHISM, *n. s.*
Fr. *eunuque*; Span. Port. and Ital. *eunico*; Lat. *eunuchus*; Gr. ευνηχος, according to Eustathius, from ευνις, de- οχειας of cohabitation. From ενος, alone, single; and εχω, to keep.—Parkhurst. From ευνη, a couch, and εχω, because they have the custody of the Eastern females.—Minsheu. One that is emasculated. To eunuchate, is to perform emasculation. Eunuchism, the state or condition of an eunuch.

He hath gelded the commonwealth, and made it an *eunuch*. *Shakspeare. Henry VI.*

It hath been observed by the ancients, that much of Venus doth dim the sight; and yet *eunuchs*, which are unable to generate, are nevertheless also dim-sighted. *Bacon's Nat. Hist.*

Neither do we think that the earth affords any thing more glorious, than *eunuchism* for the kingdom of heaven: which is therefore commended by our Saviour, not as a thing merely arbitrary, by way of advice, but of charge to the able. *Bp. Hall.*

It were an impossible act to *eunuchate* or castrate themselves. *Browne's Vulgar Errours.*

So charmed you were, you ceased awhile to doat
On nonsense gargled in an *eunuch's* throat. *Fenton.*

Next these, with prying *eunuchs* girt around
The fair sultannas of his court. *Somervile*

And now they were diverted by their suite,
Dwarfs, dancing-girls, black *eunuchs*, and a poet,
Which made their new establishment complete;
The last was of great fame, and liked to show it.
*Byron.*

Eunuch. In Britain, France, &c., eunuchs are never made but upon occasion of some disease, which renders such an operation necessary;

but in Italy they make children eunuchs, to supply the operas and theatres with singers. In the eastern parts of the world they are the guards of the women; and the seraglios of the eastern emperors are chiefly served by them.

Eunuchs, in church history, a sect of heretics in the third century, who were said to be mad enough to emasculate, not only those of their own persuasion, but even all others they could lay hold of. They took their rise from the example of Origen, who, misunderstanding these words of our Saviour, 'and eunuchs who made themselves eunuchs for the kingdom of heaven,' absolutely performed this operation on himself. Those who, out of a similar imprudent zeal, made themselves eunuchs, were, by the council of Nice, condemned, and excluded from holy orders.

EVOKE', *v. a.* } Fr. *evocation*; Lat. *evoco*,
Evoca'tion, *n. s.* } *e* and *voco*, to call; from ηχῶ, ηχος, a sound. To call forth, or out.

Would truth dispense, we could be content with Plato, that knowledge were but remembrance, that intellectual acquisition were but reminiscential *evocations*. *Browne.*

Instead of a descent into hell, it seems rather a conjuring up, or an *evocation* of the dead from hell: *Notes to Odyssea.*

So that I had no sooner *evoked* the name of Shakespeare—than a crew of strange devils—came clattering, mewing, and grinning about me. *Warburton.*

They were a barrier against those prevailing winds of superstition which consisted in the supposed *evocation* of departed spirits, and in consulting imaginary local deities, for the purpose of gratifying the natural thirst which all mankind have for the knowledge of futurity. *Archbishop Newcome.*

Lost is the patriot, and extinct his name!
Out comes the piece, another and the same;
For it, his magic pen *evokes* an O,
And turns the tide of Europe on the foe. *Young.*

Evocation, evocatio, among the ancient Romans, a religious ceremony always observed by them at the undertaking a siege, wherein they solemnly called upon the deities of the place, to forsake it and come over to them. Without performing this ceremony, they either thought the place could not be taken, or that it would be a sacrilege to take the gods prisoners. They took it for granted that their prayer was heard, and that the gods had deserted the place and come over to them, provided they were able to make themselves masters of it.

EUODIA, in botany, a genus of the monogynia order, and tetrandria class of plants: cal. a tetraphyllous perianthium: cor. four spathulated sharp and open petals; the stamina are four subulated filaments, as long as the petals; the pericarp four roundish, bivalve, and monospermous capsules; the seeds solitary. This genus is totally omitted by Lee in his different lists of plants.

EVOLVE', *v. a.* & *v. n.* } Lat. *evolvo*, *e* forth,
Evolu'tion, *n. s.* } and *volvo*, to roll. To unfold; disclose; disentangle: as a neuter verb, to disclose or open. Evolution is the act of opening or unrolling; or the series of things unfolded, or laid open.

The animal soul sooner expands and *evolves* itself to its full orb and extent than the human soul. *Hale.*

The spontaneous coagulation of the little saline bodies was preceded by almost innumerable *evolutions*, which were so various, that the little bodies came to obvert to each other those parts by which they might be best fastened together. *Boyle.*

Ambrosial odours
Does round the air *evolving* scents diffuse;
The holy ground is wet with heavenly dews. *Prior.*

The whole *evolution* of ages, from everlasting to everlasting, is so collectedly and presentifically represented to God at once, as if all things which ever were, are, or shall be, were at this very instant really present. *More's Divine Dialogues.*

Beyond long ages, yet rolled up in shades
Unpierced by bold conjecture's keenest ray,
What *evolutions* of surprising Fate! *Young.*

I knew and could execute all the *evolutions* and positions of Thevenot; and I added to them some of my own invention. *Franklin.*

Incumbent spring her beamy plumes expands
O'er restless oceans, and impatient lands,
With genial lustres warms the mighty ball,
And the great seed *evolves*, disclosing all. *Darwin.*

EVOLVENT, in the higher geometry, a term used by some for the involute, or curve resulting from the evolution of a curve, in contradistinction to that evolute, or curve supposed to be opened and evolved.

EVOLUTE, in the higher geometry, a curve first proposed by M. Huygens, and since much studied by mathematicians. It is any curve supposed to be evolved, by having a thread wrapped close upon it, fastened at one end, and beginning to evolve or unwind the thread from the other end, keeping the part evolved or wound off tight stretched: then this end of the thread will describe another curve called the involute.

Evolution, in algebra. See Algebra.

Evolution, in arithmetic. See Arithmetic.

Evolution, in geometry, is the unfolding or opening of a curve, and making it describe an evolvent. In the Philosophical Transactions, No. 160, a new quadratrix to the circle is thus found, being the curve described by the equable evolution of its periphery.

Evolution, in the art of war. See Doubling.

EVOLVULUS, in botany, a genus of the tetragynia order, and pentandria class of plants; natural order twenty-ninth, campanaceæ: cal. pentaphyllous: cor. quinquefid and verticillated: caps. trilocular: seed solitary. Species, seven herbaceous annuals of the West Indies.

EVOMITION, *n. s.* Lat. *evomo.* The act of vomiting out.

He was to receive immediate benefit either by eructation, or *evomition*. *Swift.*

EUONYMUS, the spindle-tree, a genus of the monogynia order, and pentandria class of plants; natural order forty-third, dumosæ: cor. pentapetalous: caps. pentagonal, quinquelocular, quinquevalved, and colored: seeds hooded. Species seven, the chief are,

1. E. Americanus, or evergreen spindle-tree, has a shrubby stem, dividing into many opposite branches, rising six or eight feet high, garnished with spear-shaped evergreen leaves, growing opposite, and from the sides and ends of the

branches. The flowers are quinquefid and whitish, and come out in small bunches, succeeded by roundish, rough, and protuberant capsules, which rarely perfect their seeds in this country.

2. E. Europæus has an upright woody stem ten or fifteen feet high, garnished with oblong opposite leaves: from the sides of the branches proceed small bunches of greenish quadrifid flowers, succeeded by pentagonous capsules, disclosing their seeds in a beautiful manner in autumn. The berries vomit and purge very violently, and are fatal to sheep. If powdered and sprinkled upon hair, they destroy lice. If the wood is cut when the plant is in blossom, it is tough and not easily broken; and in that state is used by watchmakers for cleaning watches, and for making skewers and tooth-pickers. Cows, goats, and sheep, eat this plant; horses refuse it.

EVORÁ, a fortified town of Portugal in the province of Alentejo, of which it is the capital, and an archbishop's see. It stands on an elevated plain in the Sierra Alpedreira mountains, and is supposed to contain a population of 10,000 persons. Here is a very complete and ancient aqueduct erected by Sertorius: this place was once also the seat of a university, and completely surrounded with walls. It is sixty-five miles east of Lisbon, and 125 north of Seville.

EUPAREA, a genus of the class and order pentandria monogynia: CAL. five-leaved: COR. five or twelve petalled: berry superior, one-celled: SEEDS many. Species one, an herbaceous plant of New Holland.

EUPATORIA, sometimes also called Kaslov, a sea-port town of the government of Taurida, on the west coast of the Crimea, Russia, rudely fortified. It has a good trade in corn, salt, and leather, and was in 1798 declared free for all nations. Sixty-eight miles south-west of Perekop.

EUPATORIUM, EUPATORY, or hemp agrimony, a genus of the polygamia æqualis order, and syngenesia class of plants: natural order forty-ninth, compositæ: receptacle naked; pappus feathery: CAL. imbricated and oblong; the style semibifid and long. There are seventy species, many of them herbaceous flowery perennials, producing annual stalks from two to three or five feet high, terminated by clusters of compound flowers of a red, purple, or white color. They are easily propagated by seeds, or parting the roots in autumn or spring. One of them, viz.

E. cannabinum, or water hemp agrimony, is a native of Britain. It is found wild by the sides of rivers and ditches, and has pale red blossoms. It has an acrid smell, and a very bitter taste, with a considerable share of pungency. The leaves are much recommended for strengthening the tone of the viscera, and as an aperient; and said to have excellent effects in the dropsy, jaundice, cachexies, and scorbutic disorders. Boerhaave informs us, that his is the common medicine of the turf diggers in Holland, against scurvies, foul ulcers, and swellings in the feet, to which they are subject. The root of this plant is said to operate as a strong cathartic; but it is hardly used in Britain, and has no place in our pharmacopœiæ.

EUPATRIDÆ, in antiquity, a name given by Theseus to the nobility of Athens, as distinguished from Geomeri and Demiurgi. The Eupatridæ had the right of choosing magistrates, teaching and dispensing the laws, and interpreting religious mysteries. See ATTICA. The whole citizens in all other matters were upon an equality. The Geomeri were husbandmen, and inferior to the Eupatridæ in point of fortune; the Demiurgi were artificers, and fell short of the Eupatridæ in number.

EUPEN, a considerable town of Prussia, on the Weeza, in the grand duchy of the Lower Rhine. It was ceded to Prussia by the peace of 1815. The French refugees of the seventeenth century introduced several important cloth manufactures here, and there are likewise some flourishing tanneries, soap works, and paper-mills. It is four miles E. N. E. of Limburg, and twenty east of Liege.

EUPHEMIA, or St. Euphemia, an ancient sea-port of Naples, seated on a bay, to which it gives name. Fifty miles north-east of Reggio. Long. 16° 32′ E., lat. 38° 44′ N.

PHEMISM, from ευς good, and φημι, to epresentation of good qualities; a figure y, in which a harsh expression is changed ess offensive.

HONY, *n. s.* } Gr. ευφωνια, from ευ,
ON'ICAL, *adj.* } well, and φωνη, the voice.
able or harmonious sound.

NY, in grammar, an easiness, smoothness, and elegance in pronunciation. Quintilian calls euphonia, 'vocalitas;' Scaliger, 'facilis pronunciatio.' Euphonia is properly a kind of figure whereby we suppress a too harsh letter, or convert it into a smoother. There are many examples in all languages.

EUPHORBIA, spurge; a genus of the trigynia order, and dodecandria class of plants: natural order thirty-eighth, tricoccæ: COR. tetrapetalous or pentapetalous, placed on the calyx: CAL. monophyllous and ventricose: CAPS. tricoccous. There are 120 species, of which seven are natives of Great Britain. They are mostly shrubby and herbaceous succulents, frequently armed with thorns, having stalks from ten or twelve inches to as many feet in height, with quadripetalous flowers of a whitish or yellow color. They are easily propagated by cuttings; but the foreign kinds must always be kept in pots in a stove. If kept dry they may be preserved for several months out of the ground, and then planted, when they will as readily take root as though they had been fresh. The juice of all the species is so acrid, that it corrodes and ulcerates the body wherever it is applied; so that physicians have seldom ventured to prescribe it internally. Warts, or corns, anointed with the juice, presently disappear. A drop of it put into the hollow of an aching tooth, gives relief, like other corrosives, by destroying the nerve. Some people rub it behind the ears that it may blister. Among the foreign species we shall only mention.

1. E. Capensis, a native of the Cape of Good Hope, which supplies the Hottentots with an ingredient for poisoning their arrows. They

method of making this pernicious mixture, is by first taking the juice extracted from the euphorbia, and a kind of caterpillar peculiar to another plant, which has much the appearance of a species of rhus. They mix the animal and vegetable matter, and after drying it they point their arrows with this composition, which is supposed to be the most effectual poison of the whole country. The euphorbia itself is also used for this purpose, by throwing the branches into fountains of water frequented by wild beasts, which, after drinking the water thus poisoned, seldom get 1000 yards from the brink of the fountain before they fall down and expire. This plant grows from about fifteen to twenty feet in height, sending out many branches full of strong spines. The natives cut off as many of the branches as they think necessary for the destruction of the animals they intend to poison. They generally conduct the water a few yards from the spring into a pit made for the purpose; after which they put in the euphorbia, and cover the spring, so that the creatures have no choice. No animal escapes which drinks of such water, though the flesh is not injured by the poison.

EUPHORBIUM, a gum exuding from the euphorbia officinarum, is brought from Barbary, in drops of an irregular form; some of which, upon being broken, are found to contain little thorns, small twigs, flowers, and other vegetable matters: others are hollow, without any thing in their cavity: the tears in general are of a pale yellow color externally, somewhat white in the inside: they easily break between the fingers. Lightly applied to the tongue, they affect it with a very sharp biting taste; and, upon being held for some time time in the mouth, prove violently acrimonious, inflaming and exulcerating the fauces, &c. This gum is extremely troublesome to pulverise; the finer part of the powder, which flies off, affecting the head in a violent manner. The acrimony of this substance is so great as to render it absolutely unfit for any internal use: several correctors have been contrived to abate its virulence, but the best of them are not to be trusted to: and as there seems to be no real occasion for it, unless for some external purposes, we think, with Hoffman and others, that it ought to be expunged from the catalogue of internal medicines. It has now no place in the London or Edinburgh Pharmacopœia. But it is still retained in most of the foreign ones, and is sometimes used as a sternutatory. The following constituents were found in euphorbium by Braconnot:—

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|---|---|
| Resin . . . . | 37·0 |
| Wax . . . . | 19·0 |
| Malate of Lime . . | 20·5 |
| Malate of potassa . . | 2·0 |
| Water . . . . | 5·0 |
| Woody matter . . . | 13·5 |
| Loss . . . . | 3·0 |
| | 100·0 |

EUPHORBUS, a famous Trojan, son of Panthöus. He was the first who wounded Patroclus, whom Hector killed. He perished by the hand of Menelaus, who hung his shield in the temple of Juno at Argos. Pythagoras the founder of the doctrine of the metempsychosis or transmigration of souls, affirmed that he had been once Euphorbus, and that his soul recollected many exploits which had been done while it animated that Trojan's body. As a proof of his assertion, he showed at first sight the shield of Euphorbus in the temple of Juno.

EUPHORION, a poet and historian, born at Chalcis, in the 126th Olympiad. Suetonius says that Tiberius composed verses in imitation of Euphorion, Rianius, and Barthenius; with whom he was charmed to such a degree, that he ordered their writings and their pictures to be kept in all the public libraries, among the ancient and celebrated authors.

EUPHRANOR, an eminent ancient sculptor and painter, who flourished about A. A. C. 362. He wrote several volumes on symmetry and the art of coloring, and was the first who signalised himself by representing heroes.

EUPHRASIA, EUPHRASY, or eye-bright, a genus of the angiospermia order, and didynamia class of plants; natural order fortieth, personatæ: CAL. quadrifid and cylindrical: CAPS. bilocular ovato-oblong; two of the antheræ having the base of the one lobe terminated by a small spine. There are eleven species, of which two are natives of Britain, viz. E. odontites, and E. officinalis. This has blue flowers, is a weak astringent, and was formerly much celebrated in disorders of the eyes; but the present practice disregards both its internal and external use. It will not grow but when surrounded by plants taller than itself. Cows, horses, goats, and sheep eat it: swine refuse it.

EUPHRASY, *n. s.* Lat. *euphrasia*. The herb eyebright; a plant supposed to clear the sight.

Then purged with *euphrasy*, and rue,
The visual nerve: for he had much to see;
And from the well of life three drops instilled.
*Milton.*

EUPHRATES, a river which all the ancient geographers represent as rising in Armenia Major; but in what particular spot, or in what direction it afterwards shapes its course, they greatly differ. Strabo says it rises in Mount Abus, a part of Mount Taurus; that it is first found on the north side of Mount Taurus; and that then running west through Armenia, and striking off to the south, it forces its way through that mountain, and escapes to Syria, when it takes a new bend to Babylonia. On the other hand, Pliny describes it as running from north to south in a right line, till it meets Mount Taurus; placing the springs together with Mount Abus, which inclines to the west on the north of Taurus. Ptolemy strikes a middle course between both, placing the springs of this river to the east as Strabo does; whence, he says, it runs a long course west before it bends south, and that it rises not from Mount Taurus, but far north of it. He makes it run straight west from its rise, then to turn south spontaneously, without any interposing obstacle, in a manner quite different from Strabo, Mela, and others, who make the Taurus the cause of this turn. The Euphrates branched into two channels at this time, one running through Babylon, and the other through

Seleucia, besides the several artificial cuts made between it and the Tigris about Babylon; and these cuts or trenches seem to be what the Psalmist calls the rivers of Babylon, on the willows of which the captives hung their harps. It is probable that the Euphrates naturally emptied itself into the sea at one mouth, before these cuts were made. Pliny, in stating the distance between the mouths of the Euphrates and the Tigris, says, some made it twenty-five and others seven miles; but that the Euphrates being for a long time back intercepted in its course by cuts made for watering the fields, only the branch called the Pasitigris fell into the sea, the rest of it into the Tigris, and both together into the Persian Gulf.

Modern travellers also describe this celebrated river as rising in the mountains of Armenia, from two principal sources. The first issues from a mountain in the vicinity of the towns of Bayazid and Diadin; the second is formed by the confluence of many streams from the mountains near Erzerum. These two streams, pursuing a westerly direction, unite near the town of Kebban in Mount Taurus, when the river flows chiefly to the south-west as far as Semisat. Here it would fall into the Mediterranean, if it were not turned into a south-east course by a high range of mountains in the neighbourhood. The Euphrates at Korna, about 130 miles from its mouth, is joined by the Tigris, and those two united streams, forming one of the noblest rivers in the east, fall into the gulf of Persia, about fifty miles south-east of Bassora.

The course of the Euphrates, before joining the Tigris, is about 1400 miles, and, adding 130 miles for the distance of the Tigris from the sea, its whole course will be upwards of 1500 miles. According to captain M. Kinneir, who wrote in 1808 from observation on the spot, the greatest increase of the Euphrates is in January, when it rises twelve perpendicular feet, and it continues to rise and fall till the end of May or the beginning of June. In the driest season it is navigable for boats of considerable burden as far as Shukashu, a village about a day's sail from the confluence of the Tigris. Above this point the tides of the Persian Gulf reach twenty or twenty-five miles, and the river is navigated during six months of the year, by flat-bottomed boats to Hibah. These boats are of the shape of a half moon, the ribs and planks roughly nailed together, and the outside covered with bitumen. The rudder is as large as the vessel, or nearly, and they have a mast and a sail. Thus provided they float down the stream, and they are dragged back again against the current. Herodotus mentions a circular sort of boats which were in use in ancient times for navigating the Euphrates; and boats of the same figure, and made of wicker-work, covered with bitumen, still ply upon this celebrated stream. In consequence of the periodical rise of the Euphrates from the melting of the snows in spring and summer, artificial canals and lakes were dug by the ancient inhabitants of Asia Minor, for the double purpose of protecting the contiguous plains from inundation, and at the same time of preserving the superfluous waters for the irrigation of the soil. Of these is the canal of Pallacopus, which was dug by the Babylonian kings. This canal had fallen into disrepair; but about the year 1793 it was partially cleaned by the nabob of Oude. It is cut from the Euphrates, and that part of it which holds water extends to within five miles of the city of Meshed Ali, or Nejiff. The remainder is nearly choked up with sand; but its course may be still traced to its termination in the Persian Gulf. The Bahr Nejiff, or sea of Nejiff, was also a work of great labor, and is of equal antiquity with the canal of Pallacopus. Captain Kinneir passed through the middle of it in his way from Samarat, or Semisat, and found it dry, with the exception of a few ravines and channels of water, near which the miserable inhabitants rear rice and vegetables. There are other canals, some of which are still in preservation, such as the Kerbela, at the extremity of which is the large and populous town of that name, and the canal of Hie, connecting the Euphrates and the Tigris, and navigable in spring for large boats: but the great works of art for protecting this country against the overflowing streams, and at the same time for preserving the water for fertilising the soil have fallen into neglect and disrepair. The Euphrates is sometimes represented to flow into the Persian Gulf by a variety of channels; navigators commonly imagining that the seven streams which fall into the Persian Gulf, all derive their origin from the common channel of the Euphrates. This, however, is not so. Only one of these streams is connected with the Euphrates, and this by an artificial canal, by means of which part of its waters flow into the channel of this river. But the great stream of the Euphrates is not divided, and it has no connexion with the other six channels which issue in the Persian Gulf.

EUPOLIS, an Athenian comic poet, who flourished about the 85th Olympiad. He took the freedom of the ancient comedy in lashing the vices of the people. He lost his life in a sea-fight between the Athenians and the Lacedemonians; and his fate was so much lamented that, after his death, it was enacted, that no poet should serve in the wars.

EURE, a river of France, which rises in the forest of Logny, near Pointgoin, in the department of Eure and Loire; passes by Courville, Chartres, Maintenon, Louviers, &c., and falls into the Seine above Pont de l'Arche.

EURE, a department of France, so named from the river which crosses it; bounded on the north by the department of the Lower Seine; on the east by that of the Oise; on the south by those of the Eure and Loire, and the Orne; and on the west by that of Calvados. It includes part of the late province of Normandy, and 422,000 inhabitants. It is a flat district, divided into the five arrondissements of Evreux (the capital), Louviers, Bernay, Andelys, and Port Audemen. The climate is very similar to that of England, though not altogether so humid or so changeable. The chief produce is wheat, barley, oats, flax, and hemp; vines are not cultivated here: the common drink is cyder. The sheep pasturage is extensive; and the number of horses in the department is computed at 30,000. The forest land is com-

puted to cover a surface of 200,000 acres; and here are several iron mines. In the towns are manufactures of woollen, linen, and leather: the broad cloth of Louviers is very superior. Evreux is the capital.

Eure and Loire, a department of France, bounded on the north-west by that of the Eure; on the east by those of the Seine and Oise, and the Loiret; on the south by those of the Loiret, and the Loire and Cher; and on the west by those of the Sarte and the Orne. The rivers Eure and Loire run through it. It contains the ci-devant province of Beauce, which has been called the granary of Paris. This district is also flat, and is divided into the four arrondissements of Chartres, Nogent le Rotrou, Chateaudun, and Dreux; its population is 266,000, among whom are 3000 Protestants. The manufactures not important, being confined to coarse woollens, leather, paper, and pins; the last chiefly made at l'Aigle. The trade of the department consists in corn, cattle, fruit, and, to a small extent, in wine; the pasturage is very good. Chartres is the capital.

EVREMOND (Charles de St.), a miscellaneous French writer of noble family, was born at Denis le Guast in Normandy in 1613. He was educated for the law at Paris and Caen, but quitted it for the army, where he rose to the rank of captain, and distinguished himself in several battles. When the civil wars of France broke out the king made him a major-general; but, after the reduction of Guienne, he was sent to the Bastile for satirising Mazarin. On the death of the cardinal, a letter of St. Evremond was discovered which gave so much offence to the court, that he would again have been imprisoned, had he not made his retreat to Holland; from whence he came to England, where Charles II. gave him a pension of £300 a year. He died in London in 1703, and was interred in Westminster Abbey. His works consist of essays, letters, poems, and dramatic pieces, and have been printed in 2 vols. 4to. and 7 vols. 12mo. There is an English translation of some of them in 2 vols. 8vo.

EVREUX, an ancient town of France, the capital of the department of the Eure. The cathedral is handsome, and the trade consists in corn, cyder, and linen and woollen cloth. It has manufactories of cotton velvets and ticks. It is seated on the Iton, twenty-five miles south of Rouen, and sixty-five north-west of Paris. In the neighbourhood is the noble castle of Navarre.

EURIPIDES, a celebrated Greek tragic poet, born about A.A.C. 468, in the isle of Salamis, on the day that Xerxes was defeated. He studied rhetoric under Prodicus, ethics under Socrates, and natural philosophy under Anaxagoras; but, at eighteen years of age, abandoned philosophy, for dramatic poetry. He used to shut himself up in a cave to compose his tragedies, which were so universally admired, that several of the soldiers of Nicias, after their defeat in Sicily, purchased their lives and liberties by reciting them; and Socrates himself set so high a value upon them, that they were the only tragedies he went to see performed. Euripides frequently intersperses through them severe reflections on the fair sex; whence he was called the woman-hater. He was, nevertheless, married: but the scandalous lives of his two wives drew upon him the raillery of Aristophanes, and other comic poets; which occasioned him to retire to the court of Archelaus, king of Macedon. Here he was well received, and made, according to Solinus, minister of state to that prince. But a few years after, as he was walking in a wood in deep meditation, he accidently met with Archelaus's hounds, and was by them torn in pieces. Archelaus buried him with great magnificence; and the Athenians were so much afflicted at his death, that the whole city went into mourning. Of ninety-two tragedies, which he composed, only nineteen remain: the most valuable editions of which are those of Aldus, in 1503, 8vo.; of Plantin in 1570, 16mo.; of Commelin in 1597, 8vo.; of Paul Stephens in 1604, 4to.; and of Joshua Barnes in 1694, folio. Wodhull and Potter have translated them into English; and valuable critical editions of portions of them have been edited by Valckenaer, Porson, Brunck, and Markland.

EURIPO, or Euripus, the celebrated channel which separates the island of Negropont from Livadia. Its greatest width is thirty-five miles; and at the town of Negropont, where it is crossed by a bridge, it is not much more than twenty paces. This strait presents a phenomenon, occasioned by the irregularity of its tides, which was remarked at a very early period. During the last two days of the moon the course of the water is periodical; but, when new moon arrives, the water alternately ebbs and flows five, nine, and even twelve or fourteen times in the day. In this place Aristotle has been said to have drowned himself out of chagrin, for not being able to account for its wonders. Euripus afterwards became a general name for all straits, where the water is in great motion and agitation. The ancient circuses had their euripi, which were pits or ditches on each side of the course. The term was particularly applied by the Romans to three canals which encompassed the circus on three sides, and which were filled occasionally to represent naumachiæ or sea battles. They also called their smaller fountains or canals in their gardens euripi; and their largest, as cascades, &c., niles.

EVRON, a town in the department of the Mayenne, France, containing 4100 inhabitants. Seven miles E.N.E. of Laval, and thirteen S.S.E. of Mayenne.

EUROCLYDON, of ευρος, the east wind, and κλυδων, a wave, is a species of wind, of which we have an account only in Acts xxvii. 14, and concerning the nature of which critics have been much divided. Bochart, Grotius, Bentley, and others substitute another reading, supported by the Alexandrian MS. and the Vulgate, viz. Ευρακυλων, or Euro-aquilo; but Mr. Bryant defends the common reading, and considers the Euroclydon, i. e. Ευρος κλυζων, as an east wind that causes a deep sea of vast inundation. Dr. Bentley supposes that the mariners in the ship, the voyage of which is recited in this passage, were Romans; but Mr. Bryant maintains that they were Greeks of Alexandria, and that the ship was an Alexandrian ship employed in the traffic of carrying corn to Italy: and therefore, that the

mariners had a name in their own language for the particular typhonic or stormy wind here mentioned. He also shows, from the passage itself, that the tempestuous wind called Euroclydon beat, *κατ αυτης*, upon the island of Crete.

EUROPA, in fabulous history, a daughter of Agenor, king of Phœnicia and Telephassa. Jupiter became enamoured of her, and to seduce her, assumed the shape of a bull, and mingled with the herds of Agenor. Europa caressed the beautiful animal; and at last had the courage to sit upon his back. The god retired toward the shore, crossed the sea, and carried Europa in safety to Crete; where, assuming his original shape, he declared his love. The nymph consented, and became mother of Minos, Sarpedon, and Rhadamanthus. After this she married Asterius, king of Crete, who adopted her sons. Some suppose that Europa lived about A.A.C. 1552.

# EUROPE.

EUROPE, one of the four general or greater divisions of the world, called by the people of Asia Frankistan, is bounded on the north by the Frozen, and on the west by the Atlantic Ocean; on the south by the Mediterranean, which separates it from Africa; and on the east by the Archipelago, which divides it in part from Asia; as also by the Black Sea; then by the river Don, till it comes near the river Volga; then it is parted from Asia by this last, and afterwards by the river Oby. It is situated between long. 9° 35 W., and 62° 25′ E., and between lat. 35° and 72° N.

The origin of the name of this important division of the earth is hid in obscurity. Bochart fancifully derives it from the Phœnician word Ur-appa, signifying 'the land of fair people,' as contrasted with the sable Africans, and tawny Asiatics: all that is with certainty known of this appellation is, that it was applied at an early period to a small district on the northern shores of the Hellespont, whence it spread over new regions, as they became added to those which were previously discovered.

Europe is about 3500 miles in length, from Cape St. Vincent in Portugal, to the Oby in Russia; and 2700 miles in breadth, from Cape Metaphan, in the Morea, to the North Cape in Lapland. Its figure is so irregular, and its outline so indented with seas, bays, and gulfs, that it is difficult to estimate its superficial extent with accuracy, but it has been calculated to contain about 225,000 square geographical leagues, or 2,700,000 square English miles. The population being computed at 185,000,000, there will be 822 inhabitants to each square league, or nearly sixty-nine to a square mile.

In commencing our description of this continent at its southern shores, the great indenting seas of Europe on the north side of the Mediterranean are the Gulf of Venice or the Adriatic, and the Archipelago or the ancient Ægean Sea. The former separates the shores of Italy from those of Dalmatia and Albania; the other divides Greece from Asia Minor. The Strait of Gallipoli, also called the Dardanelles and Hellespont, connects the Archipelago with the Sea of Marmora, which is about ninety miles in length, and forty-five in breadth. The Strait of Constantinople, the ancient Thracian Bosphorus, joins the Sea of Marmora, and the Euxine, or Black Sea, which see. Its northern shore is united by the Strait of Caffa the Cimmerian Bosphorus of the ancients, with the Sea of Azof, which is nearly 200 miles long and 100 broad. See that article.

The Bay of Biscay forms the large north-west opening between the shores of Spain and the south-western coast of France: and with the opposite approach of the Mediterranean, peninsulates the south-western portion of this continent. Further north, the British Channel separates England from France, forming a communication between the Atlantic and the German Ocean, or British Sea; and terminating to the north-west in St. George's Channel, or the Irish Sea, flowing between England, Ireland, and the west of Scotland.

'According to the observations of a gentleman conversant in marine affairs,' says a writer in the Edinburgh Philosophical Journal, Jan. 1825, 'there is a remarkable difference in the appearance, and also in the destructive effects, of the waves of the British Seas, compared with those of the Western Ocean. We doubt not that many will be surprised to be told, that the waves of the Bay of Biscay do not seem to be so destructive, in proportion to their great extent and weight, as those of our own seas. This appears to be owing to the slow pace at which these oceanic billows roll along in majestic style; while the surges of the British seas are quick in their motion, and impinge upon an obstacle with violent impulse. In evidence of the fact, it may be remarked, that the great platform of the Tour de Corduan, situate in the Bay of Biscay, at the entrance of the Garonne, is only about eighteen feet above the level of the sunken rock on which this magnificent structure is erected; and that the top of the parapet, or wall of circumvallation, which includes the store-rooms and other offices of the light-house, does not exceed twelve feet above the platform. Now, although the Corduan Rock is of much greater extent than the Eddystone or the Bell Rock, yet, judging from the appearance of things, as represented in the vignette to Mr. Smeaton's Narrative of the Eddystone Light-house, and the frontispiece to Mr. Stevenson's Account of the Bell Rock Light-house, in both of which the seas are represented as running up the building to the height of near 100 feet, we are led to apprehend, that, under like circumstances, the platform at Corduan would often be completely deluged with water, and that the offices erected upon it would be rendered wholly untenantable. And such would certainly be the case, but for the less velocity of the waves of the Bay of Biscay: occasionally

seas and sprays do pass over the parapet-wall in very stormy weather, but not with such violence as to occasion material inconvenience to the inhabitants of the Tour de Corduan.'

In about the fifty-seventh degree of north latitude, the Cattegat conducts us into the Baltic, which, after increasing in width, and stretching towards the north-east through about five degrees of latitude, separates into two branches; the Gulf of Finland, stretching eastwards and terminating near St. Petersburg, about the thirtieth degree of east longitude; and the Gulf of Bothnia, running northward beyond the sixty-sixth parallel. The length of this sea, therefore, exceeds 600 miles, while its breadth varies from about eighty to 150 miles, and the surface has been computed at 10,000 square leagues. See Baltic. The Baltic is generally frozen annually for three months, so as not only to prevent navigation, but frequently to admit of a passage over the ice, from Sweden to Finland. When Mr. James crossed from one coast to the other [illegible] February, 1814, he describes his road as 'an undeviating line from place to place, no obstacle presenting itself; we passed over the fields, through the woods, across the ice; hill and dale, land and water, were all alike: sometimes we traversed the rocky channel of a deep-[illegible] river, at other times wandered among the rivulets of a lake, at others again steered our way between the islands, over the sea.' In the southern part the ice usually breaks up in April; but the Gulfs of Bothnia and Finland seldom are clear before May is advanced.

A controversy took place among the natural philosophers of the north of Europe, about the middle of the last century, respecting the alleged gradual lowering of the level of the sea in general, and of the Baltic Sea in particular. Celsius was the first who introduced this idea to notice. He generalised it, by applying it to all the planets, and was supported by the authority of the celebrated Linné. It was soon perceived, that the point could never be settled by mere discussion, and that facts alone could lead to any certain result. Observation was therefore had recourse to; and the results of investigations, undertaken for this purpose, are now beginning to be collected in that part of the world.

In the course of 1820, and 1821, Mr. Bruncrona, assisted by the officers of the pilotage establishment, and other qualified persons, undertook the examination of all the authentic measures that had been established upon the west coast of the Baltic during the last half century. The results of this examination are given in a short but very interesting memoir inserted in the Swedish Transactions for 1823. The following table indicates the degree to which the level of this sea has fallen during the last forty years, on the coast of Sweden, at various latitudes. It is proper to remark that, in some of the places observed, the measures were much older, and in some others much more recent, than the period of forty years. In both cases the change of level that must have been effected, during this period, has been estimated by calculating the mean annual depression furnished by the observations.

| Latitude. East Coast. | Fall of Surface in forty years, in feet. | Latitude. East Coast. | Fall of Surface in forty years, in feet. | Latitude. East Coast. | Fall of Surface in forty years, in feet. |
|---|---|---|---|---|---|
| 63° 59′ | 1·50 | 59° 17′ | 2·17 | 56° 10′ | 0·00 |
| | 2·50 | 58 44 | 1·00 | 56 10 | 0·00 |
| | 0·50 | 58 42 | 1·08 | 55 53 | 0·00 |
| 61 43 | 2·50 | 58 45 | 1·17 | | |
| 61 37 | 2·83 | 58 35 | 2·00 | South-West Coast. | |
| 61 32 | 2·50 | 59 28 | 0·07 | 55 23 | 0·00 |
| 61 45 | 2·50 | 58 11 | 0·83 | 55 22 | 0·00 |
| 60 11 | 2·33 | 58 8 | 1·00 | 57 21 | 0·00 |
| 59 46 | 0·17 | 57 50 | 1·00 | 57 53 | 1·00 |
| 59 46 | 2·00 | 56 41 | 0·41 | | |

Of the facts collected, in the course of this investigation, the following may be mentioned as tending to support the opinion of a fall of level.

1. It is generally believed, among the pilots of the Baltic, that the sea has become shallower along the course which vessels ordinarily follow; but it is added, that this alteration is more sensible in the places where the tide collects sand, detached pebbles, and sea-weed, than in those where the bottom is composed of rocks. The same observation has been made in the neighbourhood of some large towns and fisheries; for example, a hydrographic chart, made in 1771, gives six fathoms for the mean depth of the sea opposite the harbour of Landskrona, whereas, in 1817, the sounding line scarcely gave five fathoms at the same point.

2. According to the oldest and most experienced pilots, the straits, which separate the numerous islets scattered along the coast of Sweden, from Haarparanda to the frontiers of Norway, received vessels that drew ten feet of water; now they are not practicable for boats that draw more than two or three feet.

3. The pilots further affirm, that, along the whole coast of Bothnia, the depth of the water undergoes a diminution, which becomes sensible every ten years, in certain places where the bottom is composed of rocks. Several other parts of the Baltic may be cited, in which a similar change has been remarked.

Mr. C. P. Hallstrom, in an Appendix to Mr. Bruncrona's Memoir, gives the following table of the diminution observed in the depth of the waters of the Gulf of Bothnia.

| Places. | Mean marked in. | Heights of the water re-observed in | Fall beneath the original mark in feet. | Number of years. | Fall of the water in 100 years in feet. |
|---|---|---|---|---|---|
| Raholem, parish of Lower Kalix, | 1770 | 1750 | 2·05 | 50 | 4·10 |
| | | 1775 | 2·49 | 75 | 4·32 |
| Stor Rebben, parish of Pitea, | 1751 | 1785 | 1·70 | 34 | 5·00 |
| | | 1796 | 1·90 | 45 | 4·22 |
| Ratan, parish of Bygdea, | 1749 | 1785 | 2·70 | 36 | 4·72 |
| | | 1795 | 2·50 | 46 | 5·43 |
| | | 1819 | 2·60 | 70 | 3·47 |
| | 1774 | 1785 | 0·55 | 11 | 5·00 |
| | | 1795 | 1·16 | 21 | 5·52 |
| | | 1819 | 1·60 | 45 | 3·57 |
| | 1795 | 1819 | 0·65 | 24 | 2·71 |
| Rönnskat, on the coast of Wasa, | 1755 | 1797 | 1·70 | 42 | 4·05 |
| | | 1821 | 2·87 | 65 | 4·35 |
| Wargön, on the coast of Wasa, | 1755 | 1785 | 1·45 | 30 | 4·83 |
| | | 1797 | 1·69 | 42 | 4·02 |
| | | 1821 | 2·87 | 65 | 4·35 |
| Lögfrundet, near Sefle, | 1731 | 1785 | 2·90 | 54 | 5·37 |
| | | 1796 | 2·17 | 65 | 3·34 |
| Ulfon, in Angermanland. | 1795 | 1822 | 1·58 | 27 | 5·85 |

It is not demonstrated that the numbers of the last column represent exactly the lowering of the water in a century; for it has not yet been sufficiently determined, if this lowering be uniform, or if it vary at different periods, and if it depend upon some local circumstance, upon the climate, or upon the state of the atmosphere. Nor is it properly established that this lowering, which becomes less perceptible from the north of the Baltic, until it disappears entirely at the southern extremity, follows precisely the same law of diminution as the latitude. It appears to be uniform in the whole extent of the Gulf of Bothnia, and it rises about four feet and a quarter in that region. At Calmar, (lat. 57° 50′) it is only two feet, but it is not yet known whether it decreases in a regular manner between these two places. Some authors consider the facts related by Messrs. Bruncrona and Hallstrom, as deciding the question in favor of those who believe in a lowering of the level of the Baltic.

The north of Europe, is encompassed by the North Sea, or Arctic Ocean, a storehouse of incalculable masses of ice: yet, hence proceed with great general regularity the innumerable shoals of fish, particularly herrings, which arrive continually on the British shores in April and May. Their progress is marked by a rippling and peculiar brightness of the water, which frequently extends for miles together, and attended (to a certain latitude at least) by the whale, the shark, and other voracious enemies of these tribes, and accompanied by prodigious flights of sea-fowls:—Mr. Pennant supposes that millions of these herrings regain the Arctic Ocean, and deposit their spawn about the month of October.

North of Russia, a vast gulf, called the White Sea, indents the upper part of this continent, and extends through several degrees of latitude to the south. It is also blocked up with ice during several months in the year; and much less visited since the commerce of Archangel, its principal port, has been diverted to St. Petersburgh. It contains several islands.

Following the northern shores of the Mediterranean and its adjacent seas, and thence proceeding through the Strait of Gibraltar to the Frozen Ocean, the following are the chief *peninsulas* of Europe, in the order in which they occur.

1. The Crimea, between the Black Sea and the Sea of Azof.

2. Greece, between the Archipelago and the Mediterranean. This portion of Europe is terminated by the Morea, the ancient Peloponnesus, which forms a second peninsula, connected with the former by the isthmus of Corinth.

3. Italy, between the Mediterranean Sea and the Gulf of Venice.

4. Spain and Portugal, comprehended by the Mediterranean, the Atlantic, and the Bay of Biscay.

5. Jutland, between the German Ocean and the Cattegat.

6. The country comprising Norway, Sweden, and Lapland, between the Baltic, the Cattegat, the North Sea, the Frozen Ocean, and the White Sea. This portion embraces the most northern point of Europe.

The *insular* portions or appendages of Europe may be thus enumerated:—The Azores, situated about thirteen degrees west of Portugal, are the farthest from its shores. In the Mediterranean the Balearic and Pityuse Isles first present themselves, the principal of which are those of Majorca, Minorca and Ivica. Eastward are Corsica and Sardinia, with Elba, Sicily, Malta, and Goza. Opposite the western coast of Greece are Corfu, Cephalonia, and Zante; with Candia still further to the south. Amid the multiplicity of islands in the Archipelago, the principal are Negropont, Mytilene, Scio, Samos, Cos, and Rhodes; with Cyprus near the southern coast of Anatolia. Passing from the Mediterranean to the North Sea and the Baltic, we have the extensive islands

of Great Britain and Ireland, and their numerous dependencies, the Hebrides, Orkneys, and Shetland Isles; with those of Jersey and Guernsey, near the coast of France. North-west of Shetland lie the Faroe Islands, and, still farther towards the Arctic circle, the large island of Iceland, the ultima Thule as it has been supposed of the ancients. The coast of Norway is furnished with numerous islands; the only cluster which here deserves notice, is the Loffoden Isles, situated between the polar circle and the seventieth degree of latitude. Beyond the northern extremity of Europe, and near the eastern entrance of the White Sea, is the Island of Colguef; still further to the east that of Waygait. The large islands of Nova Zembla are situated opposite the north-east coast of European Russia, and appear like a continuation of the Uralian Mountain range. Still further north, and locked up in the ice of the Arctic Ocean, lie the dreary and desolate islands of Spitzbergen, within ten degrees of the pole. Within the Baltic are the Islands of Funen, Zealand, and several smaller ones. Rugen, near the southern shore. Bornholm, north-east of this last, with Oland and Gothland, near the Swedish coast; Osel and Dago opposite the entrance of the Gulf of Finland, and Aland, with its attendant group, forming a belt across that of Bothnia.

The next grand distinction of this, as of the other great portions of the globe, is into *mountains* and plains; the former being here sometimes detached, but more generally in groups or chains, resting on an elevated base. Mr. Jameson gives the following perspicuous view of the high and low lands of Europe :—

In Europe we find but two high lands and one low land. The one is the great European or Southern, the other the Scandinavian or Northern. The one has its middle point in Switzerland, in the Tyrol, and in the Alps of Savoy. Hence it passes through three-fourths of France, traverses the whole of Portugal and Spain, includes nearly two-thirds of Germany, passes through the greater part of Italy, and also part of Hungary and Turkey, and terminates on the borders of the Black Sea. The course of this high land determines that of the great low land. Saxony lies nearly on the border of this low land or plain. It passes through the north part of Saxony, to the east or Baltic Sea. It also passes by the foot of the Rocky Mountains, through the upper part of Westphalia, and further through the whole of Holland, the Netherlands, and a small part of France; it even reaches the east coast of this island. It extends very considerably towards the north, including in its course Prussia, Poland, and nearly all Russia in Europe, and reaches to the Uralian Mountains, including the greater part of Moldavia. The other high land rises in Norway and Sweden, comprehends a portion of Russia, and extends with some interruption to the Uralian Mountains.

The two grand declivities, it will easily be conceived, are subdivided into others; and these form the basins of all the large European *rivers*.

Again proceeding along the northern shores of the Mediterranean, we find—

1. The Ebro, in the eastern part of the Spanish Peninsula.

2. The Rhone, which traverses the lake of Geneva, and falls into the Mediterranean.

3. The Po, discharging its waters into the gulf of Venice.

The Italian Peninsula is intersected by the Appennines, by which its breadth is too much contracted to allow of large rivers.

4. The Marissa, which falls into the Archipelago.

Coasting the Black Sea along its northern shore, we meet with—

5. The Danube, }
6. The Dniester, } Considerable rivers, falling into the Black Sea.
7. The Dnieper, }

8. The Don, which terminates in the sea of Azof.

9. The Kuban, flowing into both the sea of Azof, and the Black Sea.

10. The Volga, terminating in the Caspian Sea.

Between the straits of Gibraltar and the north of Europe, are—

11. The Guadalquiver, }
12. The Guadiana, } Having their sources in the great western
13. The Tagus, } or Spanish Peninsula.
14. The Douro, }

15. The Garonne, } Which empty themselves
16. The Loire, } into the bay of Biscay.

17. The Seine, falling into the English Channel.

18. The Rhine, }
19. The Weser, } All terminating in the German Ocean.
20. The Elbe, }

The mountains of the Northern Peninsula, between the Cattegat and the North Cape, are too near the shore to allow a course for any large rivers. The Frozen Ocean receives no extensive river between that cape and the gulf of Lapland, or White Sea. We now arrive at—

21. The Dwina, which falls into the White Sea.

22. The Petshora, terminating in the Arctic Ocean.

On entering the Baltic, we meet, along its southern coast, with—

23. The Oder, } The two principal rivers
24. The Vistula, } of the Prussian dominions.

25. The Memel, the upper part of which is called the Niemen.

26. The Duna, which falls into the gulf of Riga.

27. The Narva, } Both entering the gulf of
28. The Neva, } Finland.

These last have only a short course; the one connects the gulf of Finland with lake Peypus, the other, the same gulf with lake Ladoga; and both lakes receive rivers of considerable magnitude.

In the northern part of the Baltic, are—

29. The Kemi, } Having their rise in the
30. The Tornea, } mountains of Lapland, and falling into the gulf of Bothnia.

The Danube is the largest river that has its entire course in Europe. If we consider its length (about 1800 miles) to consist of 100 parts,

bigger; and so, as much as those *excavations* do subtract, is supplied by a fallacy of the sight.
*Wotton's Architecture.*

The cups, gilt with a golden border about the brim, were of that wonderful smallness, that Faber put a thousand of them into an *excavated* pepper-corn.
*Ray on the Creation.*

Though nitrous tempests, and clandestine death,
Filled the deep caves, and numerous vaults beneath,
Which formed with art, and wrought with endless toil,
Ran through the faithless *excavated* soil,
See the unwearied Briton delves his way
And to the caverns lets in war and day. *Blackmore.*

Flat thecæ, some like hats, some like buttons, *excavated* in the middle. *Derham's Physico-Theology.*

EXCEED', *v. a.* & *v. n.*
EXCEED'ING, *n. s. part. adj.* & *adv.*
EXCEED'INGLY, *adv.*
EXCESS', *n. s.*
EXCES'SIVE, *adj.*
EXCES'SIVELY, *adv.*
Fr. Span. and Port. *exceder*; It. *eccedere*; Lat. *excedere excessus*, i. e. *extra incedere*, to go beyond, to pass.—Minsheu. To pass beyond; outgo; excel: as a neuter verb, to go too far, or beyond limits; overbalance: exceeding is used both as a substantive, an adjective, and an adverb, by our best writers, although the last use of it is clearly a barbarism. Excess is the state of exceeding; superfluity; exuberance; transgression of limits: hence intemperance; indulgence beyond the bounds of reason.

Isaac trembled *exceedingly*. *Gen.* xxvii. 33.

Forty stripes he may give him, and not *exceed*.
*Deut.*

Talk no more so *exceeding* proudly; let not arrogance come out of your mouth. 1 *Sam.* ii. 3.

Solomon *exceeded* all the kings of the earth.
1 *Kings.*

Be not *excessive* toward any. *Eccles.*

They cried out more *exceedingly*, Crucify him.
*Mark* xv.

And at the point two stinges infixed arre,
Both deadly sharp, that sharpest steele *exceeden* farre.
*Spenser. Faerie Queene.*

Amongst the heaps of these *excesses* and superfluities, there is espied the want of a principal part of duty. *Hooker.*

It was *excess* of wine that set him on,
And on his more advice we pardon him.
*Shakspeare.*

Let the superfluous and lust-dieted man,
That braves your ordinance, feel your power quickly;
So distribution shall undo *excess*,
And each man have enough. *Id. King Lear.*

The Genoese were *exceeding* powerful by sea, and contended often with the Venetians for superiority.
*Raleigh.*

If the panicum be laid below and about the bottom of a root, it will cause the root to grow to an *excessive* bigness. *Bacon.*

Goodness answers to the theological virtue charity, and admits no *excess* but error: the desire of power in *excess* caused the angels to fall; the desire of knowledge in *excess* caused man to fall; but in charity there is no *excess*, neither can angel or man come in danger by it. *Id. Essays.*

The Earl of Surrey, lieutenant of Ireland, was much feared of the king's enemies, and *exceedingly* beloved of the king's subjects. *Davies on Ireland.*

The people's property it is, by *excessive* favour, to bring great men to misery, and then to be *excessive* in pity. *Hayward.*

The country is supposed to be *exceeding* rich.
*Abbot.*

Pride may be allowed to this or that degree, else a man cannot keep up his dignity. In gluttony there must be eating, in drunkenness there must be drinking; 'tis not the eating, nor, 'tis not the drinking, that must be blamed, but 'tis the *excess*. So in pride.
*Selden.*

There will be need of temperance in diet; for the body, once heavy with *excess* and surfeits, hangs plummets on the nobler parts. *Duppa.*

In your prayers, and places of religion, use reverent postures and great attention, remembering that we speak to God, in our reverence to whom we cannot possibly *exceed*. *Taylor.*

A popular sway, by forcing things to give
More than was fit for objects to receive,
Ran to the same extremes; and one *excess*
Made both, by striving to be greater, less.
*Denham.*

Justice must punish the rebellious deed;
Yet punish so, as pity shall *exceed*. *Dryden.*

Precious stones look *exceedingly* well, when they are set in those places which we would make to come out of the picture. *Id.*

Jesting, when not used upon improper matter, in an unfit manner, with *excessive* measure, at undue seasons, or to evil purpose, may be allowed. *Barrow.*

Members are crooked or distorted, or disproportionate to the rest, either in *excess* or defect. *Ray.*

There has been a great *exceeding* of late years in the second division, several brevets having been granted for the converting of subalterns into scarf-officers. *Spectator.*

The action of the Iliad, and that of the Æneid, were in themselves *exceeding* short; but are beautifully extended and diversified by the invention of episodes, and the machinery of the gods. *Addison.*

A man must be *excessively* stupid, as well as uncharitable, who believes there is no virtue but on his own side. *Id.*

Is not this medium *exceedingly* more rare and subtile than the air, and *exceedingly* more elastick and active? *Newton's Opticks.*

The several rays in that white light retain their colorifick qualities, by which those of any sort, whenever they become more copious than the rest, do by their *excess* and predominance cause their proper color to appear. *Id.*

Hospitality sometimes degenerates into profuseness: even parsimony itself, which sits but ill upon a publick figure, is yet the more pardonable *excess* of the two.
*Atterbury.*

Nor did any of the crusts much *exceed* half an inch in thickness. *Woodward on Fossils.*

The serum of the blood affords, by distillation, an *exceeding* limpid water, neither acid nor alkaline.
*Arbuthnot.*

And by which they have been so *exceedingly* affected as to make no doubt but that it was the instant of their conversion. *Mason.*

Some are more inclined to the sins of the flesh; sensuality, intemperance, uncleanness, sloth, self-indulgence, and *excess* in animal gratifications. *Id.*

He stripped the impostors in the noon-day sun,
Showed that they followed all they seemed to shun;
Their prayers made public, their *excesses* kept
As private as the chambers where they slept.
*Cowper.*

It is not free from inaccuracy; but, as a model of easy and graceful simplicity, it has not been *exceeded* by any thing in our language, and well deserves to be studied by every person who wishes to write pure English. *Beattie.*

Their conduct was *exceedingly* well-bred,
And gave no outward signs of inward strife,
Until at length the smothered fire broke out,
And put the business past all kind of doubt.
*Byron.*

EXCEL', *v. a.* & *v. n.*
Ex'CELLENCE, *n. s.*
Ex'CELLENCY,
Ex'CELLENT, *adj.*
Ex'CELLENTLY, *adv.*
Fr. *exceller*; Lat. *excellere*, from εξω, beyond, and κελλειν, to run.—Minsheu. To surpass; exceed in good qualities; overpower: as a neuter verb, to be eminent or superior: excellence, and excellency, mean the state of superiority or greatness: and the latter is a common title of honor bestowed on ambassadors and principal commanders, civil and military.

Reuben, unstable as water, thou shalt not *excel*.
*Gen.* xlix.

He is *excellent* in power and in judgment.
*Job* xxxvii. 23.

So fairely dight when she in presence came,
She to her sire made humble reverence,
And bowed low, that her right well became,
And added grace unto her *excellence*.
*Spenser. Faerie Queene.*

The sparke of noble corage now awake,
And strive your *excellent* selfe to *excel*.
*Id.*

Is it not wonderful, that base desires should so extinguish in men the sense of their own excellency, as to make them willing that their souls should be like the souls of beasts, mortal and corruptible with their bodies?
*Hooker.*

Then to Silvia let us sing,
That Silvia is *excelling*.
*Shakspeare.*

She loves him with that *excellence*,
That angels love good men with.
*Id.*

They humbly shew unto your *excellence*,
To have a goodly peace concluded of.
*Id.*

It is not only in order of nature for him to govern that is the more intelligent; but there is no less required, courage to protect, and, above all, honesty and probity to abstain from injury: so fitness to govern is a perplexed business. Some men, some nations, *excel* in the one ability, some in the other.
*Bacon's Holy War.*

Rules and precepts doe then help after they have bin laboured and polisht by practice; but if those rules may be made cleere and chrystalline afore-hand, it would be the more *excellent*, because they would lesse stand in need of diligence, labour, and exercise after.
*Id. On Learning.*

The conscience of a man's *excellency* will abide no limits; but spurs him forth to win admiration abroad.
*Bp. Hall.*

Ceremony keeps up things: 'tis like a penny glass to a rich spirit, or some *excellent* water; without it the water were spilt, and the spirit lost.
*Selden.*

Arts and sciences are *excellent*, in order to certain ends.
*Taylor.*

He lamented the loss of an *excellent* servant, and the horrid manner in which he had been deprived of him.
*Clarendon.*

He determines that man was erect, because he was made with hands, as he *excellently* declareth.
*Browne's Vulgar Errours.*

Venus her myrtle, Phœbus has his bays;
Tea both *excels*, which you vouchsafe to praise.
*Waller.*

Company are to be avoided that are good for nothing; those to be sought and frequented that *excel* in some quality or other.
*Temple.*

He matched their beauties where they most *excel*;
Of love sung better, and of arms as well.
*Dryden.*

I know not why a fiend may not deceive a creature of more *excellency* than himself, but yet a creature.
*Id. Juv. Dedic.*

Comedy is both *excellently* instructive and extremely pleasant; satire lashes vice into reformation; and humour represents folly, so as to render it ridiculous.
*Dryden.*

It seems plain to me, that the principle of all virtue and *excellency* lies in a power of denying ourselves the satisfaction of our own desires, where reason does not authorize them.
*Locke.*

But these incoherent apophthegms of philosophers and wise men, however *excellent* in themselves, and well intended by them, could never make a morality whereof the world could be convinced; could never rise to the force of a law that mankind could with certainty depend on.
*Id.*

The criticisms have been made rather to discover beauties and *excellencies* than their faults and imperfections.
*Addison.*

How heroes rise, how patriots set,
Thy father's bloom and death may tell;
*Excelling* others, these were great;
Thou greater still, must these *excel*.
*Prior.*

Let those teach others, who themselves *excel*;
And censure freely, who have written well.
*Pope.*

That was *excellently* observed, says I, when I read a passage in an author where his opinion agreed with mine.
*Swift.*

Though ambiguities are the first *excellence* of an impostor, they are the last of a wit.
*Young.*

Every one is apt to set the greatest value upon that kind of knowledge in which he imagines he himself most *excels*; and to undervalue all other in comparison of it.
*Mason.*

He is happy whose circumstances suit his temper; but he is more *excellent*, who can suit his temper to any circumstances.
*Hume.*

*Excellence* is never granted to man but as the reward of labour.
*Sir J. Reynolds.*

It is the great *excellence* of Shakspeare, that he drew his scenes from nature, and from life.
*Johnson.*

Osborne will never acknowledge the smallest degree of *excellence* in any production of mine.
*Franklin.*

EXCENTRIC. See ECCENTRIC.

EXCENTRIC CIRCLE, or EXCENTRIC, in the ancient Ptolemaic astronomy, was the orbit of the planet itself, which it was supposed to describe about the earth, and to be excentric with it; called also the deferent. See ASTRONOMY.

EXCENTRIC EQUATION, in the ancient astronomy, is an angle made by a line drawn from the centre of the earth, with another line drawn from the centre of the excentric, to the body or place of any planet. This is the same with the prosthaphæresis; and is equal to the difference, accounted in an arch of the ecliptic, between the real and apparent place of the sun or planet. See ASTRONOMY.

EXCEPT', *v. a.*, *n. s.*, & *prep.*
EXCEPT'ING, *prep.*
EXCEPT'ION, *n. s.*
EXCEPT'IONABLE, *adj.*
EXCEPT'IONER, *n. s.*
EXCEPT'IOUS, *adj.*
EXCEPT'IOUSNESS, *n. s*
EXCEPT'IVE, *adj.*
EXCEPT'LESS.
EXCEPT'ER, *n. s.*
Fren. *excepter*; Spanish, *eceptuar*; Italian, *eccettare*; Lat. *excipere*, i. e. *ex*, from, and *capere*, to take. To exclude, omit, or take from a list; to specify as an omission. As a

neuter verb, to object; make objections. As a preposition (originally the passive participle of the verb), except means, exclusively of; unless; provided that. Exception is either the act of excluding; the thing or person excluded; the form or manner (as an objection, cavil, &c.), or the motive of exclusion. Exceptionable is, liable to objection; doubtful in a degree. Exceptioner, he who makes objections. Exceptious, cavilling; peevish. Exceptive is, including an exception. Exceptless, general; universal; making no exception.

But when he saith, All things are put under him, it is manifest, that he is *excepted* which did put all things under him. *Cor.*

He may have *exceptions* peremptory *against* the jurors, of which he then shall shew cause. *Spenser.*

Your assertion hath drawn us to make search whether these be just *exceptions against* the customs of our church, when ye plead that they are the same which the church of Rome hath, or that they are not the same which some other reformed churches have devised. *Hooker. Preface.*

Richard *except*, those whom ye fight against,
Had rather have us win than him they follow.
*Shakspeare.*

He first took *exception* at this badge,
Pronouncing, that the paleness of this flower
Bewrayed the faintness of my master's heart. *Id.*

Roderigo, thou hast taken *against* me an *exception*; but I protest I have dealt most directly in thy affair. *Id.*

I feared to shew my father Julia's letter,
Lest he should take *exceptions* to my love. *Id.*
Forgive my general and *exceptless* rashness,
Perpetual sober gods! I do proclaim
One honest man. *Id. Timon.*

He gave Sir James Tirrel great thanks; but *took exception to* the place of their burial, being too base for them that were king's children. *Bacon.*

Revelations will soon be discerned to be extremely conducible to reforming men's lives, such as will answer all objections and *exceptions* of flesh and blood *against* it. *Hammond.*

God and his son *except*,
Nought valued he nor feared. *Milton.*
Adam, behold
The effects, which thy original crime hath wrought,
In some to spring from thee, who never touched
The *excepted* tree. *Id. Paradise Lost.*

Thus much, readers, in favour of the softer spirited Christian; for other *exceptioners* there was no thought taken. *Milton.*

It is necessary to know our duty, because 'tis necessary for us to do it; and it is impossible to do it, *except* weknow it *Tillotson.*

May I not live without controul and awe,
*Excepting* still the letter of the law?
*Dryden's Pers.*

A succession which our author could not *except* against. *Locke.*

Folly is freakish and humourous, impertinent and obstreperous, inconstant and inconsistent, peevish and *exceptious*; and consequently fastidious to society, and productive of aversation and disrespect. *Barrow.*

Friendly admonition—being delivered in an imperiously insulting way—becomes unsavory and odious, and both in shew and effect resembles a froward, malicious *exceptiousness*. *Id.*

They are so supercilious, sharp, troublesome, fierce, and *exceptious*, that they are not only short of the true character of friendship, but become the very sores of society. *South.*

When God renewed this charter of man's sovereignty over the creatures to Noah and his family, we find no *exception* at all; but that Cham stood as fully invested with this right as any of his brethren. *Id.*

The *exceptor* makes a reflection upon the impropriety of those expressions. *Burnet.*

Let the money be raised on land, with an *exception* to some of the more barren parts, that might be tax-free. *Addison.*

The only piece of pleasantry in Milton is where the evil spirits rally the angels upon the success of their artillery; this passage I look upon to be the most *exceptionable* in the whole poem. *Id.*

People come into the world in Turkey the same way they do here; and yet, *excepting* the royal family, they get but little by it. *Collier on Duelling.*

I will answer what *exceptions* they can have *against* our account, and confute all the reasons and explications they can give of their own. *Bentley.*

Pleads, in *exception* to all general rules,
Your taste of follies, with our scorn of fools.
*Pope.*

Every act of parliament was not previous to what it enacted: unless those two, by which the earl of Stafford and Sir John Fenwick lost their heads, may pass for *exceptions*. *Swift.*

*Exceptive* propositions will make complex syllogisms: as, None but physicians came to the consultation, the nurse is no physician; therefore the nurse came not to the consultation. *Watts's Logick.*

A gentleman of Sweden differs but little, *except* in trifles, from one of any other country. *Goldsmith.*

Their visible aim is not to inform your judgment, but display their own; you have many things to query and *except* against; but their loquacity gives you no room; and their good sense, set off to so much advantage, strikes a modest man dumb. *Mason.*

Such rare *exceptions*, shining in the dark,
Prove rather than impeach the just remark;
As here and there a twinkling star descried
Serves but to show how black is all beside.
*Cowper.*

Dost thou deem
None rebels *except* subjects? The prince who
Neglects or violates his trust is more
A brigand than the robber-chief. *Byron.*

EXCEPTION, in law, denotes a stop or stay to an action; and is either dilatory or peremptory in proceedings at common law: but in chancery it is what the plaintiff alleges against the sufficiency of an answer, &c. An exception is the denial of what is taken to be good by the other party, either in point of law or pleading. The counsel in a cause are to take all their exceptions to the record at one time, and before the court has delivered any opinion on it.

EXCE'RN, *v. a.* Lat. *excerno.* To strain out; to separate or emit by strainers; to send out by excretion.

That which is dead or corrupted, or *excerned*, hath antipathy with the same thing when it is alive and sound, and with those parts which do *excern*.
*Bacon's Natural History.*

Exercise first sendeth nourishment into the parts; and secondly, helpeth to *excern* by sweat, and so maketh the parts assimilate. *Id.*

An unguent or pap, prepared with an open vessel to *exern* it into. *Ray on the Creation.*

EXCERP', or | Lat. *excerptio, excerpo*;
EXCERP'T, *v. a.* | *ex* and *carpo*, to crop.
EXCERP'TION, *n. s.* | To pick out or select.
EXCERP'TOR, *n. s.* |

Times have consumed his works, saving some few *excerptions*. *Raleigh.*

In your reading *excerp*, and note in your books such things as you like. *Hales.*

I have not been surreptitious of whole pages together out of the doctor's printed volumes. I am no such *excerptor*. *Barnard.*

EXCESS'. See EXCEED.

EXCESS, in arithmetic and geometry, is the difference between any two unequal numbers or quantities, or that which is left after the less is taken from or out of the greater.

EXCHANGE', *v. a.* & *n. s.* | A compound of
EXCHAN'GER, *n. s.* | ex and CHANGE, which see. To give or take reciprocally one thing for another: it takes *with* before the party with whom the bargain or agreement to exchange is made; and *for* before the thing taken in exchange.

They shall not sell of it, neither *exchange* nor alienate the first fruits. *Ezek.* xlviii. 14.

I have bills for money by *exchange*,
From Florence, and must here deliver th[illegible]
Sh[illegible]

If none appear to prove upon thy person
Thy heinous, manifest, and many treasons,
There is my pledge: I'll prove it on thy heart.
—There's my *exchange*; what in the world he is
That names me traitor, villain-like he lies. *Id.*

*Exchange* forgiveness with me, noble Hamlet;
Mine and my father's blood, be not upon thee,
Nor thine on me. *Id. Hamlet.*

He was skilled in the *exchange* beyond seas, and all the circumstances and practices thereof.
*Hayward on Edward VI.*

The king called in the old money, and erected *exchanges* where the weight of old money was *exchanged for* new. *Camden.*

No thing, no place is strange,
While his fair bosom is the world's *exchange*.
*Denham.*

And thus they parted, with *exchange* of harms;
Much blood the monsters lost, and they their arms.
*Waller.*

The respect and love which was paid you by all who had the happiness to know you, was a wise *exchange* for the honours of the court. *Dryden.*

If blood you seek, I will my own resign:
O spare her life, and in *exchange* take mine.
*Id. Indian Empire.*

Words having naturally no signification, the idea must be learned by those who would *exchange* thoughts, and hold intelligible discourse with others. *Locke.*

Being acquainted with the laws and fashions of his own country, he has something to *exchange with* those abroad. *Id.*

He that uses the same words sometimes in one, and sometimes in another signification, ought to pass, in the schools, for as fair a man, as he does in the market and *exchange* who sells several things under the same name. *Id.*

Whilst bullion may be had for a small price more than the weight of our current cash, these *exchangers* generally choose rather to buy bullion than run the risk of melting down our coin, which is criminal by the law. *Id.*

Here then *exchange* we mutually forgiveness.
So may the guilt of all my broken vows,
My perjuries to thee be all forgotten. *Rowe.*

The world is maintained by intercourse; and the whole course of nature is a great *exchange*, in which one good turn is, and ought to be, the stated price of another. *South.*

They lend their corn, they make *exchanges*; they are always ready to serve one another. *Addison.*

Take delight in the good things of this world, so as to remember that we are to part with them, and to *exchange* them for more excellent and durable enjoyments. *Atterbury.*

The most reserved of men, that will not *exchange* two syllables together in an English coffee-house, should they meet in Ispahan, would drink sherbet, and eat a mess of rice together. *Shenstone.*

Yet ne'er with wits profane to range
Be complaisance extended;
An Atheist's laugh 's a poor *exchange*
For Deity offended! *Burns.*

I do not know how others feel, but if I had stood in that situation I never would have *exchanged* it for all that kings in their profusion could bestow.
*Burke.*

SIR ANTH. Let her foreclose, Jack; let her foreclose: they are not worth redeeming; besides, you have an angel's vow in *exchange*, I suppose, so there can be no loss there. *Sheridan.*

EXCHANGE, in architecture, a place in most trading cities, wherein the merchant, negociants, agents, bankers, brokers, interpreters, and other persons concerned in commerce, meet on certain days, and at certain hours, to confer together of matters relating to exchanges, remittances, payments, adventures, assurances, freightments, and other mercantile negociations, both by sea and land. In Holland, the ci-devant Flanders, and several cities of France, these places are called burses; at Paris and Lyons, places de change; and in the Hanse towns, colleges of merchants. These assemblies are held with so much exactness, and merchants and negociants are so indispensably required to attend them, that absence alone makes a man suspected of bankruptcy. The most considerable exchanges in Europe, are that of Amsterdam, and that of London, called the Royal Exchange. Even in the time of the ancient Romans, there were places for the merchants to meet, in most of the considerable cities of the empire. That said by some to have been built at Rome, A. U. C. 259, and A. A. C. 493, under the consulate of Appius Claudius and Publius Servilius, was called collegium mercatorum; of which it is said there are still some remains, called by the modern Romans loggia, the lodge; and now, usually, the Place of St. George. This notion of a Roman exchange is supposed to be founded on Livy's words, lib. ii.; viz. Certamen consulibus inciderat, uter dedicaret Mercurii ædem. Senatus à se rem ad populum rejecit: utri eorum dedicatio jussu populi data esset, eum præesse annonæ, mercatorum collegium instituere jussit. But it is certain that collegium never signified a building for a society in the purer ages of the Latin tongue; so that collegium mercatorum instituere must not be rendered to build an exchange for the merchants, but to incorporate the merchants into a company. As Mercury was the god of traffic, this ædes Mercurii seems

to have been chiefly designed for the devotions of this company.

Exchange, in arithmetic. See Arithmetic, Index. The operations are only different applications of the rule of three, or of practice; to perform which it is necessary to know the value of the coins and monies of account of different countries, and their proportions to each other; for which see the various tables under the article Money.

Exchange, in ancient commerce, an agreement, whereby one thing was given for another. The first commerce carried on among men was by exchange; people furnished each other mutually with what things they wanted; but such exchanges were clogged with two considerable difficulties. 1. On account of the unequal value of commodities; and 2. because every body has not just what might accommodate the person with whom he would exchange. To remove these inconveniences, money was invented for a common medium; and, instead of exchanging, buying and selling were introduced. There are many nations among whom the primitive mode of exchange still obtains; and even the most civilised people must sometimes have recourse to this method. Such, e. g. is the trade of several cities of the north and Baltic Sea, where the French exchange their wines and brandies for wood, metals, hemp, and furs.

Exchange, in modern commerce, is the receiving or paying of money in one country for the like sum in another, by bills of exchange. The punctuality of acquitting these obligations is essential to commerce; and no sooner is a merchant's accepted bill protested, than he is considered as a bankrupt. For this reason, the laws of most nations have given very extraordinary privileges to bills of exchange. Were the claims of merchants to linger under the formalities of courts of law when liquidated by bills of exchange, faith, confidence, and punctuality, would quickly disappear, and the great engine of commerce would be totally destroyed. A regular bill of exchange is a mercantile contract, in which four persons are concerned (see Bill), viz. 1. The drawer, who receives the value: 2. His debtor, in a distant place, upon whom the bill is drawn, and who must accept and pay it: 3. The person who gives value for the bill, to whose order it is to be paid: and 4. The person to whom it is ordered to be paid, creditor to the third. By this operation, reciprocal and equal debts, due in two distant parts, are paid by a sort of transfer of debtors and creditors. Thus A in London is creditor to B in Paris, value £100: C again in London is debtor to D in Paris for a like sum. By the operation of the bill of exchange, the London creditor is paid by the London debtor; and the Paris creditor is paid by the Paris debtor; consequently the two debts are paid, and no money is sent from London to Paris nor from Paris to London. In this example, A is the drawer, B is the accepter, C is the purchaser of the bill, and D receives the money. Two persons here receive the money, A and D; and two pay the money, B and C; which is just what must be done when two debtors and two creditors clear accounts. This is the plain principle of a bill of exchange; which, among other advantages, prevents all risk of loss by shipwreck, robbery, &c., which might happen from remitting payment in coin. But, when the reciprocal debts are not equal, there arises a balance on one side. Suppose London to owe Paris a balance, value £100. An exchanger, finding a demand for a bill upon Paris for £100, when Paris owes no more to London, sends £100 to his correspondent in Paris in coin, at the expense (suppose) of £1; and then, having become creditor on Paris, he can give a bill for the value of £100 upon his being repaid his expense, and paid for his risk and trouble. When merchants have occasion to draw and remit bills for the liquidation of their own debts active and passive, in distant parts, they meet upon 'Change; where (to continue the example) the creditors upon Paris, when they want money for bills, look out for those who are debtors to it. The debtors to Paris again, when they want bills for money, seek for those who are creditors upon it. This market is constantly attended by brokers, who relieve the merchant of the trouble of searching for those he wants. To the broker every one communicates his wants, so far as he finds it prudent; and, by going about among all the merchants, the broker discovers the side upon which the greater demand lies, for money or for

his renders secrecy very essential to in-
among the merchants. If the London
s want to pay their debts to Paris, when
a balance against London, it is their interest to conceal their debts, and especially the necessity they may be under to pay them: lest those who are creditors upon Paris should demand too high a price for the exchange above par. On the other hand, those who are creditors upon Paris, when Paris owes a balance to London, are as careful in concealing what is owing to them by Paris, lest those who are debtors to Paris should avail themselves of the competition among the Paris creditors, to obtain bills for their money, below their value at par. A creditor upon Paris, who is pressed for money at London, will abate something of his debt, in order to get money for it. Thus the merchants upon 'Change, from their separate and jarring interests, are constantly interested in the state of the balance. Those who are creditors upon Paris, fear the balance due to London; those who are debtors to Paris dread a balance due to Paris. The brokers determine the course of the day; and the most intelligent merchants despatch their business before the fact is generally known. In this complicated operation, the interest of trade and of the nation is concerned in the proper method of paying and receiving the balances, and in preserving a just equality of profit and loss among all the merchants, relative to the real state of the balance. Such is the nature of these operations of exchange, that it is hardly possible for a merchant to carry on his business without the assistance of the brokers. When balances come to be paid, exchange becomes intricate; and merchants are so much employed in particular branches of business, that they are obliged to leave the liquidation of their debts to men who, naturally, also consider their own advantage. Whenever a balance is to be paid, that payment costs an additional expense to those

of the place who owe it, over and above the value of the debt. If, therefore, this expense be a loss to the trading man, he must either be repaid by those whom he serves, that is, by the nation; or the trade he carries on will become less profitable. It is therefore plain, that the expense of high exchange upon paying a balance is a loss to a people, not to be compensated by enriching the few individuals among them who gain by contriving methods to pay it off. Whatever renders the profit upon trade precarious or uncertain is a loss to trade in general.

Exchange is sometimes also used for the agio, or profit allowed for the monies, advanced in any one's behalf. Thus it is a fixing of the actual and momentary value of money. Silver as a metal has a value like all other merchandise; and an additional value, as it is capable of becoming the sign of other merchandise. If it was no more than a mere merchandise, it would perhaps lose much of its nominal value. As a money, silver has a value which the prince in some respects can fix, but in others he cannot. The prince establishes a proportion between a quantity of silver, as a metal, and the same quantity, as money. He fixes the proportion between the several metals made use of as money; he establishes the weight and standard of every piece of money; in fine, he gives to every piece that ideal value already mentioned. The value of money in all these respects may be styled its positive value, because it may be fixed by law. The coin of every state has also a relative value as compared with the money of other countries. This relative value is established by the exchange, and greatly depends on its positive value. It is fixed by the current course of commerce, and by the general opinion and consent of merchants, but never by the decrees of the prince, because it is liable to incessant variations, depending on the accidental circumstances of trade, the money transactions between nations, the state of public credit, &c. Nations, in fixing this relative value, are chiefly guided by that country which possesses the greatest quantity of specie. If she has as much specie as all the others together, the others regulate theirs by her standard; and this regulation between all the others will nearly agree with the regulation made with this principal nation. The relative abundance or scarcity of specie, in different countries, forms what is called the course of exchange, and this plenty or scarcity, on which the mutability of the course of exchange depends, is not real but relative; e. g. when the French have greater occasion for funds in Holland than the Dutch have for funds in France, specie is said to be common in France, and scarce in Holland; and vice versâ.

Exchange, Arbitration of. See Arithmetic, Index.

Exchange, Bill of. See Bill.

Exchange, Par of. When money of the same standard and weight in one country, yields money of the same standard and weight in another, the exchange is then said to be at par. Thus in the year 1744 the par between France and Holland was nearly at fifty-four gros to the French crown of three livres; when the exchange is above fifty-four gros, the French say it is high; when below fifty-four gros, it is low. When the exchange is below par between one country and another, the former loses as debtor and buyer, and gains as creditor and seller. Thus if France owes Holland a certain number of gros, the more of these there are in a crown the more crowns she has to pay; and as there must be the same number of gros to buy the same quantity of merchandise, while the exchange is low, every French crown is worth fewer gros. On the contrary, if France is creditor for a certain number of gros, the less of them there are in a crown the more crowns she will receive; and if France sells her merchandise in Holland for a certain number of gros, the more crowns will she receive, in proportion as each crown contains fewer of these gros. The same reasoning will apply, mutatis mutandis, to the commercial intercourse of other countries, and to any par of exchange. A merchant may send his stock into a foreign country, when the exchange is below par, without injuring his fortune; because, when it returns, he recovers what he had lost; but a prince, who sends only specie into a foreign country, which can never return, is always a loser. The par of exchange between Great Britain and the principal places in Europe, with which, in time of peace, we have commercial intercourse, may be thus exemplified from Lloyd's List, October 4th 1825.

| | Course of Exchange. | Par about. | Explanation. | Usance. | | Days of Grace. |
|---|---|---|---|---|---|---|
| Amsterdam . . | 12. 4 | 12. 9 | Flor. & St. per £ Sterling | 1 m | d | 6 |
| Rotterdam . . | 12. 5 | 12. 9 | Flor. & St. per £ Sterling | 1 m | d | 6 |
| Antwerp . . . | 12. 4 | 12. 9 | Flor. & St. per £ Sterling | 1 m | d | 6 |
| Hamburgh . . | 37 2 | 34. 3 | Sh. & D. Flem. per £ Ster. | 1 m | d | 12 |
| Frankfort . . . | 151. | 140 | Batzen per £ Sterling | 14 d | s | 4 |
| Paris . . . . | 25. 35 | 25. 20 | Francs & Cums. per £ Ster. | 30 d | d | |
| Madrid . . . | 37. | 39 | Pence Ster. per Dol. of Ex. | 2 m | d | 14 |
| Gibraltar . . | 31. | 34½ | Pence Ster. per Current Dol. | 2 m | s | 3 |
| Leghorn . . . | 49¾ | 49 | Pence Ster. per Piastre | 3 m | d | |
| Genoa . . . | 44¾ | 45½ | Pence Ster. per Piastre | 3 m | d | |
| Venice . . . | 27 | 26. 30 | Ital. Livres per £ Sterling | 3 m | d | 6 |
| Malta . . . | | 53½ | Pence Ster. for thirty Tari. | 30 d | s | 3 |
| Naples . . . | 40¼ | 41½ | Pence Ster. per Ducat | 3 m | d | 3 |
| Palermo . . . | 122 | 124 | Pence Ster. per Oz. | 3 m | d | |
| Lisbon . . . . | 51 | 67½ | Pence Ster. per Milree | 30 d | d | 6 |
| Rio Janeiro . . | 50 | 67½ | Pence Ster. per ditto | 30 d | d | 6 |

In the above columns it appears that the exchange between London and the three first places is nearly at par. But Hamburgh, Frankfort, and Paris, give more than the par to the pound sterling, and hence the exchange is in favor of London; while Madrid, Gibraltar, and Genoa, receive less than par from London for their monies respectively.

It should also be observed that when the exchange is favorable to a place, it is only so to the buyer and remitter of foreign bills; but unfavorable to the drawer and seller. Thus the interest of each party is identified with that of the place where his funds are: and hence an unfavorable rate of exchange in any place operates as a premium for the exportation of goods, and is, so far, an advantage to that place.

The rule for reducing foreign money into English, and vice versâ, may be thus instanced: Dutch money is reduced to English by saying; As the given rate of exchange to £1 sterling, so the given Dutch to the sterling sought: and sterling is reduced to Dutch by reversing this rule. This rule will apply in all cases by merely substituting the money of other countries with the rate of exchange. See our article COINS for copious tables of these monies.

### EXAMPLE.

Reduce 8,132 guilders or florins, sixteen stivers, into sterling; exchange at ten current florins, eight stivers per pound sterling.

(= 34*s*: 8*d*. Flem.)

| G. | S. | | L. St. | | Guil. | Stiv. |
|---|---|---|---|---|---|---|
| If 10 | 8 | : | 1 | : | 8132 | 16 |
| 20 | | | | | 20 | |
| 208 | | | | | 208)162656(782 | |
| | | | | | 1456 | |
| | | | | | 1705. &c. | |

Reverse Rule.

| | G. | S. | | L. | | Guild. | Stiv. |
|---|---|---|---|---|---|---|---|
| As : | 10 | 8 | :: | 782 | : | 8132 | 16. |

Wh the price is given in Flemish, say,

| | L. St. | | Fl. | St. |
|---|---|---|---|---|
| As 34 4 | : 1 | : | 8132 | 16 |
| | | | 20 | |
| | | | 208)162656(7822 | |

The following is the COURSE OF EXCHANGE for the above day, October 4th, 1825.

| | | | |
|---|---|---|---|
| Amsterdam | C. F. | 12 | 4 |
| Ditto at sight | | 12 | 1 |
| Rotterdam | 2 U. | 12 | 5 |
| Antwerp | | 12 | 4 |
| Hamburgh | 2½ U. | 37 | 2 |
| Altona | 2½ U. | 37 | 3 |
| Paris, three days sight | | 25 | 35 |
| Ditto | 2 U. | 25 | 65 |
| Bourdeaux | | 25 | 65 |
| Berlin | | 7 | |
| Frankfort on Maine | Ex. M. | 151 | |
| Petersburgh, Rble. | 3 U. | 9¾ | |
| Vienna | effective p. 2 M. | 10 | 2 |
| Trieste | do | 10 | 2 |
| Madrid | | 37 | |
| Cadiz | | 37 | |
| Bilboa | | 36¾ | |
| Barcelona | | 36 | |
| Seville | | 36½ | |
| Gibraltar | | 31 | |
| Leghorn | | 49¾ | |
| Genoa | | 44¾ | |
| Venice | | 27 | |
| Malta | | | |
| Naples | | 40⅝ | |
| Palermo | the oz. | 122 | |
| Lisbon | | 51 | |
| Oporto | | 51 | |
| Rio Janeiro | | 50 | |
| Bahia | | 52 | |
| Buenos Ayres | | 53½ | |
| Dublin | | 9½ | |
| Cork | | 9½ | |

FOREIGN STOCKS, same day.

| | |
|---|---|
| Austrian Bonds, 5 per cent. | |
| Brasilian Bonds | |
| Ditto Scrip | 9⅛ d |
| Buenos Ayres, 6 per cent. | |
| Chilian, 6 per cent. | |
| Colombian, 6 per cent. | 75⅞ |
| Ditto, 1824 | 74⅜ |
| Danish, 5 per cent. | |
| Ditto, Marks Banco, 5 per cent. | |
| Ditto Scrip, 1825 | |
| Greek Bonds | |
| Ditto Scrip, 1825, 5 per cent. | 23¾ 3 4 d |
| Guatimala Scrip | 4⅛ 4 d |
| Mexican, 5 per cent. | 71 ex d |
| Ditto, 1825, 6 per cent. | |
| Ditto Scrip, 1825, 6 per cent. | 10¾ |
| Neapolitan, 5 per cent. | |
| Ditto, 5 per cent. 1824 | |
| Peruvian, 6 per cent. | 67½ 8 |
| Ditto Scrip, 1825, 6 per cent. | |
| Portuguese, 5 per cent. | |
| Prussian, 5 per cent. | |
| Ditto, 1822, 5 per cent. | |
| Russian, 1822, 5 per cent. | |
| Spanish, 5 per cent. Consols | 16½ ¾ ½ |
| Ditto, 1823 | |

BULLION, the oz., Oct. 4th, 1825.

| | £ | *s.* | *d.* |
|---|---|---|---|
| Portugal gold, in coin | 0 | 0 | 0 |
| Foreign gold, in bars | 3 | 17 | 6 |
| New doubloons | 0 | 0 | 0 |
| New dollars | | 4 | 11¼ |
| Silver, in bars, standard | | 5 | 1 |

BRITISH STOCKS, Oct. 4th, 1825.

| | |
|---|---|
| Bank stock | 225 |
| 3 per cent. reduced | 87 |
| 3 per cent. consols | 87⅞ 88 |
| 3½ per cent. | 95 |
| Assented | |

| | |
|---|---|
| 4 per cents. 1822 . . . . . | 102⅜ ¾ ½ |
| India stock . . . . . . . | 264 |
| Ditto bonds . . . . . . . | 14 p |
| Exchequer bills, 2*d*. . . . . | par 1 p |
| Ditto small . . . . . . . | —— |
| Ditto 1½*d*. . . . . . . . | —— |
| Consols for Oct. Acc. . . . | 88⅛ 8 ¼ ⅜ |

These subjects have of late years received that large share of public attention which their importance to a country so essentially commercial as our own would seem to demand.

I. In respect to *nominal exchange*. In the civilised part of the commercial world *bullion* is now every where recognised as the standard currency, and the comparative value of the currency of each country must depend (1st.) On the relative value of bullion there. (2dly.) On the quantity of bullion contained in the coins of that country, or on the quantity of bullion for which the paper-money, or other circulating media, will exchange.

It has, therefore, been well argued, That the real price of commodities being always proportionable, not merely to their actual cost of production, but also to the expense incurred in conveying them to where they are consumed, it follows that, if the trade in the precious metals were perfectly free, and if the commodities produced in different countries were nearly all equally well fitted for exportation, the value of bullion in different countries would be chiefly regulated by their respective distances from mines. Thus, on the supposition that neither England nor Poland had any other commodities except corn to exchange with the South Americans for bullion, it is evident that the precious metals would possess a greater value in Poland than in England, because of the greater expense of sending so bulky a commodity as corn, the more distant voyage, and because of the greater expense of conveying the gold to Poland. If Poland, however, had succeeded in carrying her manufactures to a higher pitch of improvement than England, her merchants might have been able, notwithstanding the disadvantage of distance, by exporting commodities possessed of great value in small bulk, and on which the expense of freight would have been comparatively trifling, to have sold bullion on cheaper terms than those of England. But if, as is actually the case, the advantages of skill and machinery were possessed by England, another reason would be added to that derived from her less distance from the mines, why gold and silver should be less valuable in England than in Poland, and why the money price of commodities should be higher in the former country. (Ricardo, Principles of Political Economy, &c., 1st. Ed. p. 175). After nations therefore have attained to different degrees of excellence in manufacturing industry, the value of bullion in different countries will no longer depend on their distance from the mines. But, whatever variations a different progress in the arts may occasion in the value of bullion, as compared with particular commodities in different countries, it is certain that it must always be less valuable in those countries into which it is imported than in those in which it is produced. Bullion, like every other commodity, is exported to find, not to destroy its level. And, unless its value in Europe exceeded its value in America, by a sum sufficient to cover the expenses attending its importation, and to yield the ordinary rate of profit to the importer, we should not, although the mines of Mexico and Peru were a thousand times more productive than at this moment, be able to import a single ounce of bullion.

It is incorrect, therefore, to lay down as a general proposition, 'that the par of exchange between two countries is that sum of the currency of either of the two, which, in point of intrinsic worth, is precisely equal to a given sum of the other, that is, contains precisely an equal weight of gold and silver of the same fineness.' (Bullion Report, p. 22, 8vo. edit). For a given quantity of gold and silver is not always, as is here assumed, of the same intrinsic value in different countries. It may not, indeed, differ very materially among nations in the immediate vicinity of each other, and which are all destitute of mines. But, although the value of sugar, for instance, approaches nearly to a level in the great trading cities of Europe, it cannot be maintained that its value in the West Indies is the same with its value in Bourdeaux or Liverpool; or that the exchange would be at true par, if a bill, which cost 100 hogsheads of sugar in London, only brought 100 in Jamaica. Now, this is precisely the case with bullion. Though the value of gold and silver, as compared with corn, labor, &c., may, and indeed must, vary very considerably among the different European nations, these variations are only the necessary result of their different progress in industry, and of the different quality of their cultivated lands, &c. Such a difference of prices is the natural order of things; and bullion has only found its proper level when a sufficient quantity has been introduced into those countries which excel in manufactures, so as to raise the price of their corn and labor. These variations have, therefore, no effect on the exchange. An ounce of bullion in one country, notwithstanding this difference of price, will, because of the facility of intercourse, be very nearly equivalent to an ounce of bullion in another; and, supposing the trade in the precious metals to be perfectly free, the exchange will be at true par when bills are negociated on this footing. But when we compare the value of the precious metals in very distant countries, and especially in those in which they are produced, with those into which they are imported, it is obvious that, considered merely with reference to the exchange, it must differ considerably. Gold and silver, like coal, tin, &c., must always be really cheaper in countries possessed of extraordinarily productive mines, than in those possessed of mines of a secondary degree of fertility, or in which they are entirely imported from abroad. And the exchange between such places can only be at true par when adequate allowance has been made for this difference of value. Thus, if, because of the expense of carriage, the value of bullion in Great Britain is 5 per cent. greater than in Rio Janeiro, 100 ounces of pure gold in Rio Janeiro would not be worth 100 ounces of pure gold in London, but 5 per cent. less; and the exchange would be at true par when bills for

105 ounces of standard bullion, payable in Rio Janeiro, sold in London for 100 ounces. The differences in the value of the precious metals, in different countries, have not been confined to those which depend on their respective distances from the mines, or on their different progress in the arts. The opinion formerly so very prevalent, that gold and silver alone constituted real wealth, induced almost every commercial nation to fetter and restrict their exportation, and to adopt a variety of measures intended to facilitate their importation. But these regulations, even when most rigorously enforced, have been singularly ineffectual; the great value and small bulk of the precious metals rendering it not only extremely advantageous, but also comparatively easy, to smuggle them abroad, whenever their relative value declined.

'When,' says Dr. Smith, 'the quantity of gold and silver imported into any country exceeds the effectual demand, no vigilance of government can prevent their exportation. All the sanguinary laws of Spain and Portugal are not able to keep their gold and silver at home. The continual importations from Peru and Brasil exceed the effectual demand of those countries, and sink the price of these metals below their price in the neighbouring countries. If, on the contrary, in any particular country their quantity fell short of the effectual demand, so as to raise their price above that of the neighbouring countries, the government would have no occasion to take any pains to import them. If it were even to take pains to prevent their importation, it would not be able to effect it. Those metals, when the Spartans had got wherewithal to purchase them, broke through all the barriers which the laws of Lycurgus opposed to their entrance into Lacedemon. All the sanguinary laws of the customs are not able to prevent the importation of teas of the Dutch and Gottenburgh East India Companies, because somewhat cheaper than those of the British Company. A pound of tea, however, is about 100 times the bulk of one of the highest prices, 16s., that is commonly paid for it in silver, and more than 2000 times the bulk of the same price in gold, and is consequently just so many times more difficult to smuggle.'—*Wealth of Nations*, vol II., p. 149.

It is a consequence of these principles, that whatever occasions a rise or fall in the relative value of the precious metals, in a particular country, must proportionably affect its nominal exchange with other countries. If more coin, or paper convertible into coin or bullion, circulated in Great Britain, compared with the business it had to perform, than what circulated in other countries, its relative value would in consequence be diminished. Foreign bills would sell for a premium, the amount of which would be precisely equal to the excess of the value of the precious metals in the foreign market, caused by their redundancy in the home market; and, on the other hand, in the event of the currency becoming relatively deficient, its value would be proportionably increased;—bills drawn on foreign countries would sell at a discount, the amount of which would measure the excess of the relative value of the currency of this over that of other countries.

II. In ascertaining the comparative *quantity of bullion* contained in the currencies of different countries, a particular coin of one country, such as the British pound sterling, must be taken as an integer, or standard of comparison, and the proportion between it and the coins of other countries of their mint standard weight and fineness, is ascertained by experiment. A par of exchange is thus established; or rather it is ascertained, that a certain amount of the standard currency of any particular country contains precisely as much gold or silver of the same fineness, as is contained in the coin, or integer, with which it had been compared. This relation or par, as it is technically termed, is considered invariable; and allowance is made for the subsequent variations in the comparative quantity and purity of the bullion contained in the currencies of countries trading together, by rating the exchange at so much above or below par. In mercantile language, that country, by a comparison with one or other of whose coins the par of exchange has been established, is said to give the certain for the uncertain, and conversely. Thus, in the exchange between Loudon and Paris, London and Hamburgh, &c., London gives the certain, or the pound sterling, for an uncertain, or variable number of francs, schillings, &c. Hence, the higher the exchange between any two countries, the more it is in favor of that which gives the certain, and the lower, the more is it in favor of that which gives the uncertain. On the supposition, which is very near the truth, that twenty-five francs contain the same quantity of standard bullion as a pound sterling (twenty-five francs twenty centimes is the exact par); and supposing also, that the relative value of bullion is the same in both countries, the exchange between London and Paris will be at par, when a bill drawn by a merchant in the one, on his correspondent in the other, sells at that rate; that is, when a bill of exchange for 2500 or 25,000 francs, payable in Paris, sells in London for £100 or £1000, and vice versâ. It is but seldom, however, that the coins of any country correspond exactly with the mint standard; unless, when newly issued, they are all either more or less worn; and, whenever this is the case, an allowance corresponding to the difference between the actual value of the coins and their mint value, must be made in estimating 'the sum of the existing currency of either of two countries, which contains precisely the same quantity of bullion as is contained in a given sum of the other.' Thus, if the one pound sterling was so worn, clipped, rubbed, &c., as not to contain so much bullion as twenty-five francs, but 10 per cent. less, the exchange between London and Paris would be at real par, when it was nominally 10 per cent. against London; and if, on the other hand, the pound sterling was equal to its mint standard, while the franc was 10 per cent. less, the exchange between London and Paris would be at real par, when it was nominally 10 per cent. against Paris, and in favor of London. If the currency of both countries was equally reduced below the standard of their respective mints, then it is obvious there would be no variation in the real par. But,

whenever the currency o countries trading together is depreciated in an unequal degree, the exchange will be nominally in favor of that country whose currency is least depreciated, and nominally against that whose currency is most depreciated.

It is to be further observed, that when one country uses gold as the standard of its currency, and another silver, the par of exchange between these countries is affected by every variation in the relative value of these metals. When gold rises in value comparatively to silver, the exchange becomes nominally favorable to that country which has the gold standard, and vice versâ. And hence, in making a correct estimate of the state of the exchange, between those countries which use different standards, it is always necessary to advert to the comparative value of the metals which are assumed as such.

'For example,' to use the words of Mr. Mushet, 'If 34 schillings 11¼ grotes of Hamburgh currency be equal in value to a pound sterling, or $\frac{20}{21}$ of a guinea, when silver is at 5*s.* 2*d.* per oz., they can no longer be so when silver falls to 5*s.* 1*d.*, or 5*s.* an oz., or when it rises to 5*s.* 3*d.* or 5*s.* 4*d.*; because a pound sterling in gold being then worth more or less silver, is also worth more or less Hamburgh currency.

'To find the real par, therefore, we must ascertain what was the relative value of gold and silver when the par was fixed at 34*s.* 11¼ gr. Hamburgh currency, and what is their relative value at the time we wish to calculate it.

'For example, if the price of standard gold was £3 17*s.* 10½*d.* per oz. and silver 5*s.* 2*d.*, an ounce of gold would then be worth 15·07 ounces of silver, and twenty of our standard shillings would then contain as much pure silver as 34*s.* 11¼ gr. Hamburgh currency. But if the ounce of gold were £3 17*s.* 10½*d.* and silver 5*s.* (which it was on the 2d of January 1798), the ounce of gold would then be worth 15·57 ounces of silver. If £1 sterling at par, therefore, be worth 15·07 ounces of silver, then at 15·57 it would be at 3 per cent. premium; and 3 per cent. premium on 34*s.* 11¼. is 1 schilling 1 grote and $\frac{8}{10}$, so that the par, when gold is to silver as 15·57 to 1, will be 36 schillings 1 gr. and $\frac{1}{10}$. The above calculation will be more easily made by stating as 15·07 : 34-11¼ :: 15·57 : 36-1$\frac{1}{10}$.'

Nominal exchange has however been supposed to affect the profits of the merchant more certainly, that in truly does. When, from a fall in the value of its *currency*, the nominal exchange becomes unfavorable to a particular country, the premium which its merchants receive on the sale of foreign bills, has been supposed capable of enabling them to export with profit in cases where the difference between the price of the exported commodities at home and abroad might not be such as would have permitted their exportation had the exchange been at par. Thus, if the nominal exchange was 20 per cent. against this country, a merchant who had consigned goods to his agent abroad, would receive a premium of 90 per cent. on the sale of the bill; and if we suppose freight, insurance, mercantile profit, &c., to amount to 12 or 15 per cent., it would at first sight appear as if our merchants might, in such circumstances, export commodities although their price at home should be 5 or 8 per cent. higher than in other countries. If, on the other hand, the nominal exchange was in our favor, or if bills on this country sold at a premium, it would appear as if foreigners would then be enabled to consign goods to our merchants, or our merchants to order goods from abroad, when the difference of real prices was not such as would of itself have led to an importation. But a little consideration will convince us that these fluctuations in the nominal exchange can have no such effect. The same fall in the value of the currency which renders the exchange unfavorable, and causes foreign bills to sell at a premium, must equally increase the price of all commodities. And hence, whatever might be the amount of the premium which the exporter gained by the sale of the bill drawn on his correspondent abroad, it would do no more than indemnify him for the enhanced price of the goods exported. Mercantile operations are, in such cases, conducted precisely as they would be if the exchange was really at par; that is, by a comparison of the real prices of commodities at home and abroad, meaning, by real prices, the prices at which they would be sold, provided there was no depreciation of the currency. If those prices are such as to admit of exportation or importation with a profit, the circumstance of the nominal exchange being favorable or unfavorable will make no difference whatever in the transaction. 'Suppose,' says Mr. Blake, 'the currencies of Hamburgh and London being in their due proportions, and therefore the nominal exchange at par, that sugar, which from its abundance in London sold at £50 per hogshead, from the scarcity at Hamburgh would sell at £100. The merchant in this case would immediately export. Upon the sale of this sugar, he would draw a bill upon his correspondent abroad for £100 which he could at once convert into cash, by selling it in the bill market at home, deriving from this transaction a profit of £50 under deduction of the expenses of freight, insurance, commission, &c. Now, suppose no alteration in the scarcity or abundance of sugar in London and Hamburgh, and that the same transaction were to take place, after the currency in England had been so much increased, that the prices were doubled, and, consequently, the nominal exchange 100 per cent. in favor of Hamburgh, the hogshead of sugar would then cost £100 leaving apparently no profit whatever to the exporter. He would, however, as before, draw his bill on his correspondent for £100; and, as foreign bills would bear a premium of 100 per cent., he would sell this bill in the English market for £200, and thus derive a profit from the transaction of £100 depreciated pounds, or £50 estimated in undepreciated currency, deducting, as in the former instance, the expense of freight, insurance, commission, &c.

'The case would be precisely similar, mutatis mutandis, with the importing merchant. The unfavorable nominal exchange would appear to occasion a loss, amounting to the premium on the foreign bill, which he must give in order to pay his correspondent abroad. But, if the

difference of real prices in the home and foreign markets were such as to admit of a profit upon the importation of produce, the merchant would continue to import, notwithstanding the premium; for that would be repaid to him in the advanced nominal price at which the imported produce would be sold in the home market. 'Suppose, for instance, the currencies of Hamburgh and London being in their due proportions, and, therefore, the nominal exchange at par, that linen, which can be bought at Hamburgh for £50 will sell here at £100, the importer immediately orders his correspondent abroad to send the linen, for the payment of which he purchases at £50 a foreign bill in the English market, and on the sale of the consignment for £100 he will derive a profit, amounting to the difference between £50 and the expense attending the import.

'Now, suppose the same transaction to take place, without any alteration in the scarcity or abundance of linen at Hamburgh and London, but that the currency of England has been so augmented as to be depreciated to half its value, the nominal exchange will then be 100 per cent. against England, and the importer will not be able to purchase a £50 foreign bill for less than £100. But, as the prices of commodities here will have risen in the same proportion as the money has been depreciated, he will sell his linen to the English consumer for £200, and will, as before, derive a profit amounting to the difference between £100 depreciated, or £50 estimated in undepreciated money, and the expenses attending the import. The same instances might be put in the case of a favorable exchange; and it would be seen in the same manner, that nominal prices and the nominal exchange being alike dependent on the depreciation of currency, whatever apparent advantage might be derived from the former, would be counterbalanced by a loss on the latter, and vice versâ.' *Observations*, &c. p. 48.

2. *Of real exchange.*—The expense of the transfer of bullion from country to country, constitutes the limit within which the rise and fall of the real exchange between them must be confined. In this respect, as in most others, transactions between foreign countries are regulated by the very same principles which regulate those between different parts of the same country. The principle holds universally. Whatever may be the expense of transmitting bullion, or the money of the commercial world, between London and Paris, Hamburgh, New York, &c., it is impossible that the real exchange of the one or the other should, for any considerable period, be depressed to a greater extent. For no merchant will ever pay a greater premium for a bill to discharge a debt abroad, than what would suffice to cover the expense of transmitting bullion to his creditor. Hence it appears, that whatever has a tendency to obstruct or fetter the intercourse between different countries, must also have a tendency to widen the limits within which fluctuations in the real exchange may extend. It is this principle which enables us to account for its varying so much more in time of war than in time of peace. The amount of the bills drawn on a country engaged in hostilities is, from various causes which we shall afterwards notice, liable to be suddenly increased; though it is certain, that whatever may be the amount of the bills thus thrown into the market, the depression of the exchange cannot, for any length of time, exceed the expense of conveying bullion from the debtor to the creditor country. But during war this expense is increased; the charges on account of freight, insurance, &c., being then necessarily augmented. It appears from the evidence annexed to the Report of the Bullion Committee, that the expense of conveying gold from London to Hamburgh, which, previously to the war, only amounted to 2 or 2½ per cent., had, in the latter part of 1809, increased to about 7 per cent.; showing, that the limits within which fluctuations of the real exchange were confined in 1809, were about three times as great as those within which they were confined in 1793. This also enables us to account for the greater steadiness of the real exchange between countries in the immediate vicinity of each other. The expense of transmitting a given quantity of bullion from London to Dublin or Paris, is much less than the expense of transmitting the same quantity from London to New York or Petersburgh. And, as fluctuations in the real exchange can only be limited by the cost of transmitting bullion, they may consequently extend much farther between distant places, than between those that are contiguous.

We may here briefly investigate the circumstances which give rise to a favorable or an unfavorable balance of payments, and endeavour to appreciate their effects on the real exchange, and on the trade of a country in general.

A great object of the whole system of commercial policy, a system which still continues to preserve the ascendancy in this and in every other country in Europe, is to create a favorable balance of payments, and consequently, a favorable real exchange, by facilitating exportation and restricting importation. It is foreign to the object of this article, to enter into any examination of the principles of this system, except in so far as they are connected with the subject of exchange; but we hope to show, in opposition to some popular opinions on the subject, that in every country carrying on an advantageous commerce, the value of the imports must always exceed the value of the exports; and that this excess of importation has not, in ordinary cases, the least tendency to render unfavorable the real exchange.

The proper business of the merchant, it has been well observed, consists in carrying the various products of the different countries of the world, from those places where their exchangeable value is least, to those where it is greatest; or, which is the same thing, in distributing them according to the effective demand. It is clear, however, that there could be no motive to export any commodity unless the commodity which it was designed to import in its stead was of greater value. No merchant ever did or ever will export but with the view of importing a greater value in return. And so far from an

excess of exports over imports being any criterion of an advantageous commerce, it is quite the reverse; and the truth is, contends an able writer in the Supplement to the Encyclopædia Britannica, notwithstanding all that has been said and written to the contrary, that unless the value of the imports exceeded the value of the exports, foreign trade could not be carried on. Were this not the case, were the value of the exports always greater than the value of the imports, merchants would lose on every transaction with foreigners, and the trade with them would either have no existence at all, or if begun, would have to be speedily relinquished.

'In England, the rates at which exports and imports are valued, were fixed so far back as 1696. But the very great alteration that has since taken place, not only in the value of money, but also in the real price of most part of the commodities produced in this and other countries, has rendered this official valuation of no use whatever as a criterion of the true value of the exports and imports. In order to remedy this defect, an account of the real, or declared value of the exports is annually prepared and laid before parliament; but even this is ver, far from accurate. It must always be the ty. rest of the merchant to endeavour to conceal as real amount of the goods imported on whic an duties are charged; while, on the other hand, it is very frequently his interest to magnify the amount of those commodities on the export of which either a bounty or a drawback is allowed. If perfectly accurate accounts could be obtained of the value of the exports and imports of a commercial country, there can be no manner of doubt, that in ordinary years there would be always an excess of imports over exports. The value of an exported commodity is estimated at the moment of its being sent abroad, and before its value is increased by the expense incurred in transporting it to the place of its destination; but the value of the commodity imported in its stead, is estimated after it has arrived at its destination; and, consequently, after its value has been enhanced by the cost of freight, insurance, importer's profit, &c.

'It is of very little importance, in as far at least as the interests of commerce are concerned, whether a nation acts as the carrier of its own imports and exports, or employs others. A carrying nation will appear to derive a comparatively large profit from its commercial transactions; but this excess of profit is nothing more than a fair remuneration for the capital employed and the risk incurred in transporting commodities from one country to another. If the whole trade between this country and France was carried on in British bottoms, our merchants, in addition to the value of the goods exported, would also receive the expense of the carriage to France. This, however, would not occasion any loss to that country. The French merchants must pay the freight of the commodities they import; and if the English can afford it on cheaper terms than their own countrymen, there can be no good reason why they should not employ them in preference. In the United States the value of the imports, as ascertained by the Custom-house returns, always exceeds the value of the exports. And, although our practical politicians consider the excess of exports over imports as the only sure criterion of an advantageous commerce, '*it is nevertheless true, that the real gain of the United States has been nearly in proportion as their imports have exceeded their exports.*'—Pitkin on the Commerce of the United States. This has in part been occasioned by the Americans generally exporting their own surplus produce; and, consequently, receiving from foreigners, not only an equivalent for their exports, but also for the cost of conveying them to th foreign market. In 1811, says the author ju quoted, flour sold in America for nine dolla and fifty cents per barrel, and in Spain for fiftee dollars. The value of the cargo of a vessel ca rying 5000 barrels of flour would, therefore, l estimated, at the period of its exportation, : 47,500 dollars; but as this flour would, becaus of freight, insurance, exporter's profits, &c., se in Spain for 75,000 dollars, the American me chant would be entitled to draw on his agent i Spain for 27,500 dollars more than the flour co in America, or than the sum for which he coul have drawn, had the flour been exported on ac count of a Spanish merchant. If, as is mo probable, the 75,000 dollars were invested in som species of Spanish or other European good, th freight, insurance, &c., on account of the retur cargo, would, perhaps, increase its value t 100,000 dollars; so that, in all, the America merchant might have imported commoditi worth 52,500 dollars more than the flour orig nally sent to Spain. It is as impossible to den that such a transaction as this is advantageous, a it is to deny that its advantage consists entirel in the excess of the value of the goods importe over those exported. And it is equally clea that, although such transactions as the above ha been multiplied to an inconceivable exten America might, notwithstanding, have had th real balance of payments in her favor. Insteac therefore, of endeavouring to fetter and restri the trade with those countries from which w should otherwise import a greater value than w exported, we ought, on the contrary, to give every possible facility. There is not a privat merchant in the kingdom who does not conside that market as the best in which he is enabled t obtain the highest price, or the greatest value i exchange for his goods; why then should he b excluded from it? Why compel him to dispos of a cargo of muslin for £10,000 rather tha £12,000? The wealth of a state is made up c the wealth of individuals; and it is impossibl that any more effectual method of increasin individual wealth can be devised than to perm every person to make his purchases in the cheap est and his sales in the dearest market.

3. On the subject of *computed exchange*, w have only room to observe—When the nomina and real exchange are both favorable, or both un favorable, the computed exchange will expres their sum; when the one is favorable, and th other unfavorable, it will express their differenc Thus, for example, the currency of Great Britai is of the mint standard and purity, and the cu rency of France 5 per cent. degraded, the no

minal exchange will be 5 per cent. in favor of this country. But the real exchange may, at the same time, be either favorable or unfavorable. If it be also favorable to the extent of 1, 2, 3, &c. per cent. the computed exchange will be 6, 7, 8, &c. per cent. in favor of this country. And, on the other hand, if it is unfavorable to the extent of 1, 2, 3, &c., per cent. the computed exchange will be only 4, 3, 2, &c., per cent. in our favor. When the real exchange is in favor of a particular country, provided the nominal exchange be equally against it, the computed exchange will be at par, and vice versâ. A comparison of the market with the mint price of bullion, affords the best criterion whereby to ascertain the state of the exchange at any particular period.

Having given in our article COINS tables of the real monies of most known countries, we here subjoin

TABLE I.—An Estimate of the Value of the MONIES OF ACCOUNT of all the chief commercial Places (expressed in Pence, and Decimals of Pence), according to the Mint Price both of Gold and Silver in England; that is, £3 17*s.* 10½*d.* per oz. for Gold, and 5*s.* 6*d.* (as fixed in the New Coinage), per oz. for Silver.

| | | Value in Silver. | Value in Gold. |
|---|---|---|---|
| Aix la Chapelle | Rixdollar current . . . | 33, 43 | 31, 43 |
| Amsterdam . | Rixdollar banco (agio at 4 per cent.), | 58, 16 | variable |
| | Florin banco . . . | 23, 26 | ditto |
| | Pound Flemish banco . . | 139, 56 | ditto |
| | Rixdollar current . . . | 55, 93 | ditto |
| | Florin current . . . | 22, 35 | ditto |
| | Pound Flemish current . . | 134, 13 | ditto |
| Antwerp | Pound Flemish (money of exchange) | 131, 20 | 123, 87 |
| | Florin (money of exchange), | 21, 87 | 20, 64 |
| | Pound Flemish current . | 112, 47 | 106, 18 |
| | Florin current | 18, 73 | 17, 70 |
| Barcelona . . | Libra Catalan | 30, 28 | 26, 70 |
| Basil . . . | Rixdollar, or ecu of exchange | 50, 32 | 47, |
| | Rixdollar current | 45, 19 | 42, 20 |
| Berlin . . . | Pound banco . . . | 50, 29 | variable |
| | Rixdollar current . . . | 38, 32 | ditto |
| Bern . . . . | Ecu of 3 livres . . . | 45, 39 | 42, 90 |
| | Crown of 25 batzen . . | 37, 82 | 35, 75 |
| Bremen . . . | Rixdollar current . . | 40, 24 | variable |
| | Rixdollar in Carls d'or . . | —— | 39, 68 |
| Cassel . . . | Rixdollar current . . . | 40, 24 | variable |
| Cologne . . | Rixdollar specie of 80 albuses . | 33, 40 | ditto |
| | Rixdollar current of 78 albuses | 32, 25 | ditto |
| Constantinople | Piastre, or dollar . . . | 13, 96 | uncertain |
| Dantzic . . . | Gulden, or Florin . . . | 9, 58 | 9, |
| Denmark . . | Rixdollar specie . . . | 58, 25 | —— |
| | Rixdollar crown money . . | 51, 49 | —— |
| | Rixdollar Danish currency . | 47, 13 | 44, 88 |
| England | Pound Sterling . . . | 240, | 240, |
| Florence | Lira . . . . . . | 8, 62 | 8, 53 |
| | Ducat, or crown current . . | 60, 36 | 59, 71 |
| | Scudo d'oro, or gold crown . | —— | 63, 97 |
| France . . | Livre Tournois . . . | 10, 16 | 9, 38 |
| | Franc (new system), . . | 10, 33 | 9, 52 |
| Francfort . | Rixdollar convention money . | 40, 24 | 37, 65 |
| | Rixdollar Muntze, or in small coins | 33, 53 | —— |
| Germany . | Rixdollar current . . . | 40, 24 | variable |
| | Rixdollar specie . . . | 53, 65 | ditto |
| | Florin of the Empire . . | 26, 83 | ditto |
| | Rixdollar Muntze . . . | 33, 53 | ditto |
| | Florin Muntze . . . | 22, 36 | ditto |
| Geneva . . | Livre current . . . | 17, 17 | 16, 93 |
| | Florin . . . . . | 4, 89 | 4, 84 |
| Genoa . | Lira fuori Banco . . . | 8, 50 | 7, 83 |
| | Pezza, or dollar of exchange . | 48, 90 | 45, 02 |
| | Scudo di cambio or crown of exchange | 39, 12 | 36, 02 |
| Hamburgh . | Mark Banco (at a medium), | 19, 39 | variable |
| | Pound Flemish Banco . | 145, 46 | ditto |
| | Mark current . . | 15, 78 | ditto |
| | Pound Flemish current . | 118, 32 | ditto |
| Hanover . | Rixdollar, in cash . . | 44, 71 | 42, 26 |
| | Rixdollar, gold value . | 41, 51 | 39, 24 |

| | | Value in Silver. | Value in Gold. |
|---|---|---|---|
| Ireland | Pound Irish | 221, 56 | 221, 56 |
| Konigsberg | Gulden or florin | 12, 77 | variable |
| Leghorn | Pezza of 8 reals | 49, 76 | 49, 16 |
| | Lira moneta buona | 8, 65 | 8, 55 |
| | Lira moneta lunga | 8, 29 | 8, 19 |
| Leipsic | Rixdollar convention money | 40, 24 | variable |
| | Rixdollar in Louis d'ors or Fredericks | —— | 39, 68 |
| Malta | Scudo or crown | 22, 69 | 23, 34 |
| Milan | Lira Imperiale | 11, 08 | 10, 53 |
| | Lira corrente | 7, 83 | 7, 44 |
| | Scudo Imperiale | 64, 83 | 61, 60 |
| | Scudo corrente | 45, 05 | 42, 78 |
| Modena | Lira | 3, 53 | —— |
| Munich | Gulden or florin | 22, 36 | 21, 28 |
| Naples | Ducat of 1818 | 43, 90 | 41, 22 |
| Parma | Lira | 2, 60 | 2, 40 |
| Persia | Toman of 100 mamoodis | 306, 15 | —— |
| Poland | Gulden or florin | 6, 42 | 6, 27 |
| Portugal | Milree | 73, 18 | 67, 34 |
| | Old Crusade | 29, 27 | 26, 94 |
| Riga | Rixdollar Alberts | 55, 96 | variable |
| | Rixdollar currency (agio at 40 per cent.), | 39, 95 | ditto |
| Rome | Scudo or crown | 55, 40 | 51, 63 |
| | Scudo di Stampa d'oro | 84, 49 | 78, 73 |
| Russia | Ruble | 40, 98 | 39, 35 |
| Sardinia | Lira | 19, 38 | 18, 82 |
| Sicily | Ounce | 130, 44 | 124, 80 |
| | Scudo or crown | 52, 18 | 49, 92 |
| Spain | Real of old plate | 5, 25 | 4, 57 |
| | Real of new plate | 5, 58 | 4, 86 |
| | Real of Mexican plate | 6, 97 | 6, 07 |
| | Real Vellon | 2, 79 | 2, 43 |
| | Dollar of old plate, or of exchange | 41, 99 | 36, 59 |
| Sweden | Rixdollar | 58, 98 | 56, 43 |
| Switzerland | Franc (new system), | 23, 57 | —— |
| Trieste | Floren, Austrian currency | 26, 83 | 25, 05 |
| | Lira, Trieste currency | 5, 07 | 4, 73 |
| | Lira di piazza | 4, 95 | 4, 63 |
| Turin | Lira | 12, 01 | 11, 23 |
| Valencia | Libra | 41, 99 | 36, 59 |
| Venice | Lira piccola (in the old coins), | 5, 39 | variable |
| | Lira piccola (in the coins introduced by the Austrians) | 4, 52 | ditto |
| Vienna | Florin | 26, 83 | 25, 05 |
| Zant | Real | 4, 32 | variable |
| Zurich | Florin, money of exchange | 27, 52 | ditto |
| | Florin current | 25, 02 | ditto |

TABLE II.—The general PAR of EXCHANGE between England and the following places, viz. Amsterdam, Hamburgh, Paris, Madrid, Lisbon, Leghorn, Genoa, Naples, and Venice, computed from the intrinsic Value of their principal Coins, by comparing Gold with Gold, and Silver with Silver, according to their Mint Regulations, and to Assays made at the London and Paris Mints. (Given in by Dr. Kelly to the Committee of the House of Lords, on the expediency of the Bank's resuming Cash Payments).

| | GOLD. | | SILVER. | | | | EXPLANATIONS. |
|---|---|---|---|---|---|---|---|
| | | | Old Coinage. | | New Coinage. | | |
| | Mint Regulations. | Assays. | Mint Regulations. | Assays. | Mint Regulations. | Assays. | Monies of Exchange. |
| Amsterdam, Banco | 36 8 | 36 6,8 | 37 3 | 37 10,5 | 35 0 | 35 6,5 | Schillings and Pence Flemish per Pound Sterling. Agio 2 per cent. |
| Ditto, Current | 11 4,5 | 11 3,8 | 11 8,5 | 11 11,8 | 10 14,6 | 10 17,6 | Florins and Stivers per Pound Sterling. |
| Hamburgh . | 34 3,5 | 34 1,5 | 35 1 | 35 1,3 | 32 11 | 32 11,5 | Schillings and Pence Flemish Banco per Pound Sterling. |
| Paris . . . | 25 20 | 25 26 | 24 73 | 24 91 | 23 23 | 23 40 | Francs and Cents per Pound Sterling. |
| Madrid . . | 37·3 | 37·2 | 39·2 | 39·0 | 41·7 | 41·5 | Pence Sterling for the Piastre or Dollar of Exchange. |
| Lisbon . . | 67·4 | 67·5 | 60·41 | 58·33 | 64·30 | 62·09 | Pence Sterling per Milree. |
| Leghorn . . | 49·1 | 49·0 | 46·46 | 46·5 | 49·60 | [illegible]5 | Pence Sterling per Pezza of Exchange. |
| Genoa . . | 45·5 | 45·5 | 46·46 | 48·9 | 49·4 | 52·0 | Pence Sterling per Pezza Fuori Banco. |
| Naples . . | 41·22 | | 41·22 | | 43·9 | | Pence Sterling per Ducat (New Coinage of 1818). |
| Venice . . | 46·3 | 46·0 | 47·5 | 49·0 | 44·6 | 46·1 | Lire Piccole per Pound Sterling. |

EXCHANGE, REAL, is also used for the profit which a merchant, negociant, or broker makes of a sum of money received, and for which a bill of exchange is drawn, payable in some other place, and by some other person, for the interest of his money, and the reward of his negociation. This profit is exceedingly various; being sometimes two, sometimes three, four, or even ten and fifteen per cent., according as the alloy of the species differs, or as money is more or less plentiful, or bills of exchange more or less scarce, in the places. This kind is sometimes called mercantile or mixed exchange.

EXCHANGE, SMALL, is used to denote the profit allowed for exchanging one species of money for another. This is also called natural or pure exchange, &c.

EXCHE'AT, *n. s.* }
EXCHE'ATOR. } See ESCHEAT.

He by my ruins thinks to make them great :
To make one great by others loss, is bad *excheat.*
*Spenser.*

These earls and dukes appointed their special officers ; as sheriff, admiral, receiver, havener, customer, butler, searcher, comptroller, gager, *excheator,* feodary, auditor, and clerk of the market. *Carew.*

EXCHEQ'UER, *n. s.* & *v. a.* Fr. *exchequier ;* Ital. *scacciere ;* from Goth. and Swed. *skat ;* Teut. *schatz ;* treasure, cognate with our word scot ; a tribute in scot and lot. A court into which the revenues of the crown are brought, and where they are exacted or defended : the verb has latterly come into familiar use, to express the instituting a process against a person at this court. See below.

I will be cheater to them both, and they shall be *exchequers* to me. *Shakspeare.*

Your treasures
Are quite exhausted, the *exchequer's* empty.
*Denham.*

Clipped money will pass whilst the king's bankers and at last the *exchequer* takes it. *Locke.*

High worth is elevated place : 'tis more,
It makes the post stand candidate for thee ;
Makes more than monarchs, makes an honest man ;
Though no *exchequer* it commands, 'tis wealth.
*Young.*

EXCHEQUER, in the British jurisprudence, an ancient court of record, in which all causes concerning the revenues and rights of the crown are heard and determined. Some writers state that it took this name from the cloth that covered the table of the court, which was party-colored, or chequered. It is said to have been erected by William the Conqueror, its model being taken from a similar court established in Normandy. Anciently its authority was so great that it was held in the king's palace, and its acts were not to be examined or controlled in any other of the king's courts; but at present it is the last of the four courts at Westminster. In the exchequer, some reckon seven courts, viz. those of pleas, accounts, receipts, exchequer chamber (which is an assembly of all the judges on difficult matters

in law), errors in the exchequer, errors in the king's bench, and, lastly, the court of equity in the exchequer. But the exchequer, for the despatch of business, is generally divided into two parts. Officers of the receipt may take one penny in the pound, as their fee for sums issued out: and they are obliged, without delay, to receive the money brought thither; and the money received is to be put into chests under three different locks and keys, kept by three several officers. All sheriffs, bailiffs, &c., are to account in the exchequer; and in the lower part, termed the receipt, the debtors of the king and persons in debt to them, the king's tenants, and the officers and ministers of the court, are privileged to sue one another, or any stranger, and to be sued in the like actions as are brought in the court of king's bench and common pleas. The judicial part of the exchequer is a court both of law and equity. The court of law is held in the office of pleas, according to the course of common law, before the barons: in this court the plaintiff ought to be a debtor or accountant to the king; and the leading process is either a writ of subpœna, or quo minus, which last goes into Wales, where no process out of courts of law ought to run, except a capias utlagatum. The court of equity is held in the exchequer chamber, before the treasurer, chancellor, and barons; but, generally, before the barons only: the lord chief baron being the chief judge to hear and determine all causes. The proceedings in this part of the exchequer are by the English bill and answer, according to the practice of the court of chancery; with this difference, that the plaintiff here must set forth that he is a debtor to the king, whether he is so or not. It is in this court of equity that the clergy exhibit bills for the recovery of their tythes, &c. Here too the attorney general exhibits bills for any matters concerning the crown; and a bill may be exhibited against the king's attorney by any person aggrieved in any cause prosecuted against him on behalf of the king, to be relieved therein: in which case the plaintiff is to attend on the attorney general, with a copy of the bill, and procure him to give an answer thereto; in the making of which he may call in any person interested in the cause, or any officer, or others to instruct him, that the king be not prejudiced thereby, and his answer is to be put in without oath. Besides the business relating to debtors, farmers, receivers, accountants, &c., all penal punishments, intrusions, and forfeitures upon popular actions, are matters likewise cognizable by this court; where there also sits a puisne baron, who administers the oaths to high sheriffs, bailiffs, auditors, receivers, collectors, surveyors, and searchers of all the customs, &c. The court of exchequer in Scotland has the same privileges and jurisdiction as that of England; and all matters competent to the one are competent to the other.

Exchequer Bills, bills of credit issued by the authority of parliament, payable with interest out of the produce of a particular tax, or more frequently out of the supplies to be granted in a future session. By statute 5 Ann. c. 13, the lords treasurers may cause exchequer bills to be made of any sums not exceeding £1,500,000, for the use of the war; and the duties upon houses were made chargeable with £4 10*s*. per cent, per annum to the bank for circulating them. The bank not paying the bills, actions to be brought against the company, and the money and damages recovered: and if any exchequer bills be lost, upon affidavit of it before a baron of the exchequer, and certificate from such baron, and security to pay the same if found, duplicates are to be made out: also when bills are defaced, new ones shall be delivered. The king, or his officers in the exchequer, by former statutes, might borrow money upon the credit of bills, payable on demand, with interest after the rate of 3*d*. per diem for every £100 bill. And by 8 and 9 Wil. III. c. 20, an interest of 5*d*. a day was allowed for every £100. But 12 Wil. III. c. 1, lowered the interest on these bills to 4*d*. a-day per cent. And by 12 Ann. c 11. it sunk to 2*d*. a-day. The exchequer bills presently in circulation bear interest at the rate of 3½*d*. a-day per cent.; which is computed up to the day of sale, from the respective dates of the bills. They are generally for £100 each, but many of those issued on the vote of credit are for £1000, and they have sometimes been made out for much larger sums: they are all numbered arithmetically, and registered accordingly, for the purpose of paying them off in a regular course. The time of payment is notified by advertisement, and they are paid at the exchequer-bill office, Westminster. The daily transactions between the bank and the exchequer are chiefly carried on by bills of £1000 each, which are deposited by the bank in the exchequer to the amount of the sums received by them on government account; the bank notes and cash thus received by the bank being retained by them, as the detail part of the money concerns of government is all transacted at the bank. The instalments on loans are paid into the receipt of the exchequer by these exchequer bills of £1000 each, which are received again by the bank as cash, either for the amount of dividends due, or in repayments of advances; and as, while deposited in the exchequer, they are considered merely as a pledge of security, they of course continue to bear interest till the advance on which the bank first received them is paid off. In October 1796, the 5 per cent. exchequer bills, issued on the vote of credit, being at a considerable discount, it was thought proper to fund them, when it was agreed that the holders should be entitled for every £100 to either of the following capitals: £176 19*s*. 9¾*d*. in the 3 per cents. £137 18*s*. 7¼*d*. in the 4 per cents.; or £118 6*s*. 10¼d. in the 5 per cents. Bills were thus funded to the amount of £1,433,870, and a capital stock of £2,374,333 14*s*. 8*d*. created in the different funds. In Nov. 1801, it was again found necessary to fund a considerable part of the outstanding exchequer bills, which was done upon the following conditions; for each £100 principal to receive the undermentioned proportions of stock:

| | | | | |
|---|---|---|---|---|
| £25 | 3 per cent. consols, estimated at | £17 | 1 | 10½ |
| £25 | 3 per cent. reduced, . . . . | 16 | 16 | 10½ |
| £50 | 4 per cent. consols, . . . . | 42 | 7 | 6 |
| £25 | New 5 per cents, . . . . . | 24 | 15 | 0 |
| | 1*s*. 9*d*. Long annuity . . . | 1 | 14 | 4 |
| | | £102 | 15 | 7 |

And the proprietors to have the liberty of subscribing £50 additional in money for ever £100 they held in bills, the money thus raised to be applied in paying off the sum of about £2,400,000 in exchequer bills in possession of the bank. The amount of the bills funded and redeemed was £8,910,450.—As there is always a considerable sum outstanding in exchequer bills, the interest paid thereon forms a constant addition to the annual charge of the funded debt. The premium or discount at which exchequer bills sell, depends on the proportion which the interest payable on them bears to the interest produced by the public funds, according to their current prices.—Forging exchequer bills, or the indorsements thereof, was always made a capital felony; by the several acts under which they were issued, as it is now by the act 48 Geo. III. c. 1, for the general regulation of the issuing and paying off exchequer bills: which act is referred to by every subsequent act for raising money by exchequer bills. See FUNDS, and NATIONAL DEBT.

EXCHEQUER, BLACK BOOK OF THE, an ancient statistical work under the keeping of the two chamberlains of the exchequer; said to have been composed, in 1175, by Gervais of Tilbury, nephew of king Henry II. and divided into several chapters. Herein is contained a description of the court of England, as it then stood, its officers, their ranks, privileges, wages, perquisites, power, and jurisdiction; and the revenues of the crown, in money, grain, and cattle. Here we find, that for one shilling, as much bread might be bought as would serve 100 men a whole day; that the price of a fat bullock was only 12*s.* and of a sheep 4*s.* &c.

EXCISE', *n. s.* & *v. a.*
EXCIS'ABLE, *adj.*
EXCISE'MAN.
Fr. *accise*: Dutch *accijs*; Lat. *excisum*; cut off. An inland impost on various commodities specified by act of parliament. See below. Excisable is, liable to the excise duties: exciseman, the lowest officer of the excise.

The people should pay a ratable tax for their sheep, and an *excise* for every thing which they should eat.
*Hayward.*

*Excise,*
With hundred rows of teeth, the shark exceeds,
And on all trades like Cassawar she feeds.
*Marvel.*

Hire large houses, and oppress the poor,
By farmed *excise*. *Dryden's Juvenal.*

Ambitious now to take *excise*
Of a more fragrant paradise. *Cleaveland.*

In South-sea days, not happier when surmised
The lord of thousands, than if now *excised*. *Pope.*

Thae curst horse-leeches o' the' *Excise*,
Wha mak the whisky stells their prize!
Haud up thy han', Deil! ance, twice, thrice!
There, seize the blinkers!
An' bake them up in brunstane pies. *Burns.*

The rigour and arbitrary proceedings of *excise* laws seem hardly compatible with the temper of a free nation. For the frauds that might be committed in this branch of the revenue, unless a strict watch is kept, make it necessary, wherever it is established, to give the officers a power of entering and searching the houses of such as deal in *exciseable* commodities, at any hour of the day, and, in many cases, of the night likewise. *Dr. A. Rees.*

EXCISE is otherwise derived from the Belgic accüsse, tribute; and defined to be an inland, duty or imposition, paid sometimes upon the consumption of the commodity, or frequently upon the wholesale, which is the last stage before the consumption. This is doubtless the most economical way of taxing the subject; the charges of levying, collecting, and managing the excise duties, being considerably less in proportion than in other branches of the revenue. It also renders the commodity cheaper to the consumer, than charging it with customs to the same amount would do, because generally paid in a much later stage of it. The proceedings, in case of a transgression of the excise laws, are however very prompt and arbitrary; so that a man may be convicted in two days time in the penalty of many thousand pounds, by commissioners or justices of the peace; to the total exclusion of the trial by jury, and disregard of the common law. For which reason lord Clarendon tells us, that though to his knowledge the earl of Bedford (who was made lord treasurer by king Charles I.) intended to have set up the excise in England, it never made a part of that unfortunate prince's revenue; being first introduced, on the model of the Dutch prototype, by the parliament itself after a rupture with the crown. Such was at that time the opinion of its general unpopularity, that when in 1642 'aspersions were cast by malignant persons upon the house of commons, that they intended to introduce excises, the house for its vindication did declare, that these rumors were false and scandalous, and that their authors should be apprehended and brought to condign punishment.' Its original establishment was in 1643, and its progress was gradual; being at first laid upon those persons and commodities where it was supposed the hardship would be least perceivable, viz. the makers and venders of beer, ale, cyder, and perry; the royalists at Oxford then followed the example of their brethren at Westminster, by imposing a similar duty: both sides protesting, that it should be continued no longer than to the end of the war, and then be utterly abolished. But the parliament soon after imposed it on flesh, wine, tobacco, sugar, and such a multitude of other commodities, that it might be fairly denominated general: in pursuance of the plan laid down by Mr. Pym (who seems to have been the father of the excise), in his letter to Sir John Hotham, 'that they had proceeded in the excise to many particulars, and intended to go on farther; but that it would be necessary to use the people to it by little and little.' Afterwards, when the nation had been accustomed to it for a series of years, these champions of liberty boldly declared 'the impost of excise to be the most easy and indifferent levy that could be laid upon the people;' and accordingly continued it during the whole usurpation. Upon king Charles II.'s return, it having then been long established and its produce well known, some part of it was given to the crown (in 12 Car. II.), by way of purchase for the feudal tenures and other oppressive parts of the hereditary revenue. But, from its first origin to the present time, its name has been odious to the people. It has, nevertheless, been

imposed on a great number of other commodities. Thus brandies and other spirits are now excised at the distillery; printed silks and linens, at the printer's; starch and hair powder, at the maker's; gold and silver wire, at the wire drawer's; and all plate whatsoever. To these we may add coffee and tea, chocolate and cocoa paste, for which the duty is paid by the retailer; all artificial wines, commonly called sweets; paper and pasteboard, first when made, and again if stained or printed; malt, as already mentioned; vinegars, and glass; for all which the duty is paid by the manufacturer; hops, for which the person that gathers them is answerable; candles and soap, which are paid for at the maker's; malt liquors brewed for sale, which are excised at the brewery; cyder and perry at the vender's; leather and skins, at the tanner's; and, lastly, tobacco, at the manufacturer's. The excise, like the customs, is necessarily regulated by a multiplicity of statutes; the abridgement of which would form no small volume. The produce of the excise duties for the year ending Jan. 5th 1825, was £26,768,039, and as this is the most important item of the public revenue, we shall be found to give it its due consideration in the article FUNDS.

EXCISE, COMMISSIONERS OF. The excise was formerly farmed out; but is now managed for the king by commissioners who receive the whole product of the excise, and pay it into the exchequer. They are obliged by oath to take no fee or reward but from the king himself; and from them there lies an appeal to five other commissioners called commissioners of appeal.

One principal head office of excise is to be kept in London, or within ten miles thereof, to which all other offices in the kingdom shall be subordinate and accountable; which said office shall be managed by such commissioners as the king shall appoint. And all the places within the bills of mortality shall be under the immediate care and management of the said head office. Stat. 12 Car. II. The kingdom at large is divided into fifty *collections* of excise, which are again subdivided into *districts*, *out-rides*, and *foot-walks*.

EXCI'SION, *n. s.* Lat. *excisio*. Extirpation; destruction; ruin; the act of cutting off; the state of being cut off.

Pride is one of the fatalest instruments of *excision*. *Decay of Piety.*

Such conquerors are the instruments of vengeance on those nations that have filled up the measure of iniquities, and are grown ripe for *excision*. *Atterbury.*

EXCITE', *v. a.*
EXCIT'ABLE, *adj.*
EXCITA'TION, *n. s.*
EXCITE'MENT, *n. s.*
EXCIT'ER.
Fr. *exciter*; Lat. *excitare*, from *ex* and *cito*, to call. To stir up; rouse; animate; awaken: excitable is easy to be excited.

For ther passing study han freshed our wittes, and oure understandynge han *excited* in consideracion of trouth by sharpenes of ther resons. *Chaucer.*

The Lacedemonians were more *excited* to desire of honour with the excellent verses of the poet Tirtæus, than with all the exhortations of their captains. *Spenser's Ireland.*

How stand I then,
That have a father killed, a mother stained,
*Excitements* of my reason and my blood,
And let all sleep? *Shakspeare. Tempest.*

All putrefactions come from the ambient body, either by ingress of the ambient body into the body putrefied, or by *excitation* and solicitation of the body putrefied, by the body ambient. *Bacon.*

They never punished the delinquency of the tumults and their *exciters*. *King Charles.*

His affections were most quick and *excitable*. *Barrow.*

That kind of poesy which *excites* to virtue the greatest men, is of greatest use to human kind. *Dryden.*

This they are capable of understanding; and there is no virtue they should be *excited* to, nor fault they should be kept from, which I do not think they may be convinced of. *Locke.*

Hope is the grand *exciter* of industry. *Decay of Piety.*

The original of sensible and spiritual ideas may be owing to sensation and reflection, the recollection and fresh *excitation* of them to other occasions. *Watts's Logick.*

Last, as observant Imitation stands,
Turns her quick glance, and brandishes her hands,
With mimic acts associate thoughts *excites*,
And storms the soul with sorrows or delights. *Darwin.*

EXCLAIM', *v. n.* & *n. s.*
EXCLAIM'ER, *n. s.*
EXCLAMA'TION,
EXCLAM'ATORY, *adj.*
Fr. *exclamer*; Sp. and Port. *exclamar*; Lat. *exclamare*, from *ex*, emphatic, and *clamo*, to call out. To call or cry out vehemently; to vociferate: as a substantive, Shakspeare uses it for clamor; outcry: exclamatory is of the nature of an exclamation.

The ears of the people are continually beaten with *exclamations* against abuses in the church. *Hooker, Dedication.*

This ring,
Which, when you part from, lose, or give away,
Let it presage the ruin of your love,
And be my 'vantage to *exclaim* on you. *Shakspeare.*

Is Cade the son of Henry the Fifth,
That thus you do *exclaim* you'll go with him? *Id.*

Alas, the part I had in Glo'ster's blood
Doth more solicit me than your *exclaims*,
To stir against the butchers of his life. *Id.*

Either be patient, or intreat me fair,
Or with the clamorous report of war,
Thus will I drown your *exclamations*. *Id.*

O Musidorus! Musidorus! but what serve *exclamations*, where there are no ears to receive the sound? *Sidney.*

The most insupportable of tyrants *exclaim* against the exercise of arbitrary power. *L'Estrange.*

I conclude with those *exclamatory* words of St. Paul—'How unsearchable are his judgments, and his ways past finding out!' *South.*

I must tell this *exclaimer*, that his manner of proceeding is very strange and unaccountable. *Atterbury.*

Those who *exclaim* against foreign tyranny, do, to this intestine usurper, make an entire dedition of themselves. *Decay of Piety.*

P. In the poetry of our language I don't think we are to look for any thing analogous to the notes of the gamut: for, except perhaps in a few *exclamations* or interrogations, we are at liberty to raise or sink our voice an octave or two at pleasure, without altering the sense of the words. *Darwin.*

EXCLUDE', *v. a.*
EXCLU'SION, *n. s.*
EXCLU'SIVE, *adj.*
EXCLU'SIVELY, *adv.*
Fr. *exclurre*; Span. and Port. *excluyr*; Ital. *excludere*; Lat. *excludere*, from *ex*, out, and *clau-*

*dere*, to shut. To shut out; hinder from admission; debar; eject; except: the compounds following these meanings.

They separate from all apparent hope of life and salvation, thousands whom the goodness of Almighty God doth not *exclude*. *Hooker.*

In bodies that need detention of spirits, the *exclusion* of the air doth good; but in bodies that need emission of spirits, it doth hurt. *Bacon.*

They obstacle find none
Of membrane, joint, or limb, *exclusive* bars:
Easier than air with air, if spirits embrace,
Total they mix. *Milton's Paradise Lost.*

It is not easy to discern among the many differing substances obtained from the same portion of matter, which ought to be esteemed, *exclusively to* all the rest, its inexistent elements or ingredients; much less what primogenial and simple bodies, conveyed together, compose it. *Boyle.*

Justice, that sits and frowns where publick laws
*Exclude* soft mercy from a private cause,
In your tribunal most herself does please;
There only smiles, because she lives at ease. *Dryden.*

Sure I am, unless I win in arms,
To stand *excluded* from Emilia's charms. *Id.*

How were it possible the womb should contain the child, nay, sometimes twins, 'till they come to their due perfection and maturity for *exclusion*? *Ray on the Creation.*

Others ground this disruption upon their continued or protracted time of delivery, wherewith *excluding* but one a-day, the latter brood impatient, by a forcible proruption, antedates their period of *exclusion*. *Browne's Vulgar Errours.*

The salt and lixiviated serosity, with some portion of choler, is divided between the guts and bladder, yet it remains undivided in birds, and hath but a single descent by the guts with the *exclusions* of the belly. *Id.*

Though these three sorts of substances do not *exclude* one another out of the same place, yet we cannot conceive but that they must necessarily each of them *exclude* any of the same kind out of the same place. *Locke.*

In scripture there is no such thing as an heir that was, by right of nature, to inherit all, *exclusive* of his brethren. *Id.*

Fenced with hedges and deep ditches round,
*Exclude* the encroaching cattle from thy ground. *Dryden's Virgil.*

If he is for an entire *exclusion* of fear, which is supposed to have some influence in every law, he opposes himself to every government. *Addison.*

The first part lasts from the date of the citation to the joining of issue, *exclusively*: the second continues to a conclusion in the cause, inclusively. *Ayliffe's Parergon.*

This is Dutch partnership, to share in all our beneficial bargains, and *exclude* us wholly from theirs. *Swift.*

I know not whether he reckons the dross, *exclusive* or inclusive, with his three hundred and sixty tons of copper. *Id.*

Ulysses addresses himself to the queen chiefly or primarily, but not *exclusively of* the king. *Broome.*

Who gave beginning can *exclude* an end. *Young.*

There are few people who have not, at particular seasons, experienced the effect of certain accidental associations, which obtrude one impertinent idea, or set of ideas, on the mind, to the *exclusion* of every other. *Percival.*

As style and expression were all we had in view, we *excluded* every idea of invention. *Franklin.*

Parliaments were often hastily assembled, and it was probably in the king's power, by the manner in which he issued his writs for that purpose, to *exclude* such as were averse from his measures. *Robertson's History of Scotland.*

By these we are to rectify, and to these are we to conform, all our opinions and sentiments in religion, as our only standard, *exclusive* of all other rules, light, or authority, whatsoever. *Mason.*

Is sparkling wit the world's *exclusive* right?
The fixed fee-simple of the vain and light? *Cowper.*

The Saxon mines have till very lately almost *exclusively* supplied the rest of Europe with cobalt, or rather with its preparations, zaffre and smalt, for the exportation of the ore itself is there a capital crime. *Darwin.*

The morn broke, and found Juan slumbering still
Fast in his cave, and nothing clashed upon
His rest; the rushing of the neighbouring rill,
And the young beams of the *excluded* sun,
Troubled him not, and he might sleep his fill. *Byron.*

EXCO'CT, *v. a.* Lat. *excoctus*. To boil up; produce by boiling.

Salt and sugar, *excocted* by heat, are dissolved by cold and moisture. *Bacon's Natural History.*

EXCŒCARIA, in botany, a genus of the triandria order, and diœcia class of plants; natural order thirty-eighth, tricoccæ. Male amentum naked: CAL. none: COR. none; styles three: CAPS. tricoccous. See ALOEXYLUM, and XYLO ALOES.

EXCOGITATE, *v. a.* & *v. n.* } Lat. *excogito*,
EXCOGITA'TION. } i. e. *ex*, emphatic, and *cogito*, to think. To discover; invent; strike out in thinking: to think.

I take it to be my duty—to *excogitate* of myself wherein I may; but derive your virtues, &c. *Bacon.*

The tradition of the origination of mankind seems to be universal; but the particular methods of that origination *excogitated* by the heathen, were particular. *Hale's Origin of Mankind.*

If the wit of man had been to contrive this organ, what could he have possibly *excogitated* more accurate? *More.*

To indulge the power of fiction, and send imagination out upon the wing, is often the sport of those who delight too much in silent speculation. When we are alone we are not always busy; the labour of *excogitation* is too violent to last long. *Johnson. Rasselas.*

EXCOMMU'NICATE, *v. a.* & } Fren. *ex-*
EXCOMMU'NICABLE, [*adj. n. s.* } *communier*;
EXCOMMUNICA'TION, *n. s.* } Ital. *excommunicare*, from Lat. *ex*, from, and *communio*, communion. To separate or eject from the Christian church or fellowship: to separate from any visible church by ecclesiastical censure.

Perhaps *excommunicable*; yea, and cast for notorious improbity. *Hooker.*

As for *excommunication*, it neither shutteth out from the mystical, nor clean from the visible church; but only from fellowship with the visible in holy duties. *Id.*

Thou shalt stand curst and *excommunicate*;
And blessed shall he be, that doth revolt
From his allegiance to an heretick. *Shakspeare.*

Thou *excommunicate*
From all the joys of love. *Donne.*

**What if they shall *excommunicate* me, hath the doctrine of meekness any salve for me then?**

***Hammond's Pract. Catech.***

**The office is performed by the parish-priest at interment, but not unto persons *excommunicated*.**

***Ayliffe's Parergon.***

EXCOMMUNICATION was originally instituted for preserving the purity of the church; but ambitious ecclesiastics converted it by degrees into an engine for promoting their own power, and inflicted it on the most frivolous occasions. The power of excommunication, as well as other acts of ecclesiastical discipline, was lodged in the hands of the clergy, who distinguished it into greater and less. The greater, called παντελης αφορισμος, i. e. total separation and anathema, consisted in an absolute and entire exclusion from the church and the participation of all its rites. When any person was thus excommunicated, notice was given of it by circular letters to all the most eminent churches, that they might confirm this act of discipline, by refusing to admit the delinquent to their communion. The consequences of this excommunication were very terrible. The excommunicated person was avoided in civil commerce and outward conversation. No one durst receive him into his house, or eat at the same table with him; and when dead, he was denied the solemn rites of burial. The less excommunication, simply called αφορισμος, i. e. separation or suspension, consisted in excluding men from the participation of the eucharist, and the prayers of the faithful. But they were not expelled the church; for they had the privilege of being present at the reading of the Scriptures, the sermons, and the prayers of the catechumens and penitents. This excommunication was inflicted for smaller crimes; such as neglecting to attend the service of the church, misbehaviour in it, and the like.

The causes of excommunication in England are, contempt of the bishop's court, heresy, neglect of public worship and the sacraments, incontinency, adultery, simony, &c. It is described to be twofold. But if the judge of any spiritual court excommunicates a man for a cause of which he has not the legal cognizance, the party may have an action against him at common law, and he is also liable to be indicted at the suit of the king. Heavy as the penalty of excommunication is, there are many who would despise the brutum fulmen of mere ecclesiastical censures. The law, therefore, steps in to their aid, and lends a supporting hand to an otherwise tottering authority. By the common law, an excommunicated person is disabled to do any act that is required to be done by one that is probus et legalis homo. He cannot serve upon juries; cannot be a witness in any court; and cannot bring an action to recover lands or money due to him. And if, within forty days after the sentence has been published in the church, the offender does not submit to the sentence of the spiritual court, the bishop may certify such contempt to the king in chancery. Upon which there issues out a writ to the sheriff of the county, called from the bishop's certificate a significavit; or from its effect, a writ de excommunicato capiendo; and the sheriff shall thereupon take the offender and imprison him in the county jail, till he is reconciled to the church, and such reconciliation certified by the bishop; upon which another writ de excommunicato deliberando, issues out of the chancery to release him.

The Romish pontifical mentions three kinds of excommunication, viz. 1. The minor, incurred by those who have any correspondence with an excommunicated person. 2. The major, which falls upon those who disobey the commands of the holy see, or refuse to submit to certain points of discipline, in consequence of which they are excluded from the church militant and triumphant, and delivered over to the devil and his angels. 3. Anathema, which is properly that pronounced by the pope against heretical princes and countries.

*Excommunication, in the Church of Scotland,* consists only in an exclusion of openly profane and immoral persons from the ordinances of baptism and the lord's supper, but is seldom publicly denounced, and is attended with no civil incapacity whatever.

*Excommunication, in the Greek Church,* cuts off the offender from all communion with the 318 fathers of the first council of Nice, and with the saints; consigns him over to the devil and the traitor Judas; and condemns his body to remain after death as hard as a flint, or piece of steel, unless he humbles himself, and makes atonement for his sins by a sincere repentance. The form abounds with dreadful imprecations; and the Greeks assert that if a person dies excommunicated, the devil enters into the lifeless corpse; and therefore, in order to prevent it, the relations of the deceased cut his body in pieces, and boil them in wine. It is a custom for the patriarch of Jerusalem annually to excommunicate the pope and church of Rome; on which occasion, he drives a nail into the ground with a hammer, as a mark of malediction.

*Excommunications, in the Jewish Church.*—Elias, a German rabbi, and others, speak of three kinds of excommunication among the Jews: the first was niddui, or separation of the person from things holy, for the space of thirty days; the second, chrem, or anathema, which ratified the former, and excluded the offender from the synagogue, and from civil commerce; the third, shammatha, which was published by 300 or 400 trumpets, and implied a final exclusion from the synagogue. But Selden has pretty fully evinced that niddui and shammatha are promiscuously used, and oft signify the same censure; and therefore that there were but two kinds of excommunication among the Jews; a lesser and a greater. Among the modern Jews, excommunication is attended with the most terrible consequences. The excommunicated person is refused all human assistance; if there is a corpse in his house, or a child to be circumcised, none must help him. He is cursed by the book of the law, by the curse of Joshua against Jericho, by that of Elisha against the children, by heaven and earth, and God is besought that a whirlwind may dash him to pieces. He is pelted with stones if he appears in the streets; and, if he obtains absolution, it is upon the most mortifying conditions; for he is publicly tied to a post and

whipped; after which he lays himself down at the door of the synagogue, and all those who go out pass over him. Such was the case with the famous Acosta, born in Portugal about the beginning of the seventeenth century, who, after embracing Judaism, became dissatisfied with the Jewish rites, was excommunicated, and lay under the sentence fifteen years; was re-admitted into the synagogue upon making his submission; was excommunicated a second time, and was for seven years abandoned by his friends, and reduced to a wretched condition; when he again made his submission, and was publicly scourged, &c., as above mentioned. The death of any under the sentence of excommunication is celebrated by the Jews with feasting and diversion. The introduction of various excommunications into the Jewish church seems to be entirely a tradition of the elders, for the law of Moses mentions but one, viz. 'That soul shall be cut off from among his people.'

EXCO'RIATE, *v. a.* } Old Fr. *excorier*, from
EXCORIA'TION, *n. s.* } Lat *ex* privative, and *corium* skin. To flay; strip off the skin.

It hath marvellously enhanced the revenues of the crown, though with a pitiful *excoriation* of the poorer sort. *Howel.*

An hypersarcosis arises upon the *excoriated* eye-lid, and turneth it outward. *Wiseman's Surgery.*

A looseness proves often a fatal symptom in fevers; for it weakens, *excoriates*, and inflames the bowels. *Arbuthnot.*

The pituite secerned in the nose, mouth, and intestines, is not an excrementitious, but a laudable humour, necessary for defending those parts from *excoriations*. *Id.*

Survivor sole, and hardly such, of all
That once lived here, thy brethren, at my birth
(Since which I number threescore winters past),
A shattered veteran, hollow-trunked perhaps,
As now, and with *excoriate* forks deform,
Relics of ages! *Cowper.*

EXCORIATION, in medicine and surgery, the galling, or rubbing off of the cuticle, especially of the parts between the thighs and about the anus. In adults, it is occasioned by riding, much walking, or other vehement exercise, and may be cured, by vulnerary applications. In children there is often an excoriation, not only of the parts near the pudenda, chiefly of the groin and scrotum, but likewise in the wrinkles of the neck and under the arms; proceeding from the acrimony of urine and perspiration, and occasioning itching pains, crying, restlessness, &c. The parts affected should be often washed with warm water, and sprinkled with drying powders, as flour, chalk, tutty, or lapis calaminaris, tied loosely in a rag, and the powder shaken out on the parts; but ceruse, which some nurses use in this way, is very dangerous.

EX'CREMENT, *n. s.*
EXCREMENT'AL, *adj.*
EXCREMENTITI'OUS,
EXCRE'TION, *n. s.*
EXCRET'IVE, *adj.*
EXCRE'TORY. *adj.* & *n. s.*

Fr. *excrement*, *recrement*; Italian, *escremento*, *recremento*; Spanish and Portuguese, *excremento*; Lat. *excrementum*, *recrementum*, a *excerno*, from *ex* and *cerno*; Gr. κρινω, to separate. The refuse part of human food; that which is rejected or voided by the natural passages; sometimes applied to any excrescence, as hair, &c. Excrementitious is containing excrement. Excretion is the act of separating excrements, or the thing separated. Excretive and excretory (as an adjective), having the power or quality of ejecting them. Cheyne defines the latter as a substantive.

It fares with politick bodies as with the physical; each would convert all into their own proper substance, and cast forth as *excrement* what will not so be changed. *Raleigh's Essays.*

God hath given virtue to springs, fountains, earth, plants, and the *excremental* parts of the basest living creatures. *Raleigh.*

We see that those *excrements*, that are of the first digestion, smell the worst; as the *excrements* from the belly. *Bacon.*

The *excrementitious* moisture passeth in birds through a fairer and more delicate strainer than in beasts. *Id.*

The moss from apple-trees is little better than an *excretion*. *Id.*

The poyson's gone thro' all; poysons affect
Chiefly the chiefest parts; but some effect
In nails, and hairs, yea *excrements*, will show:
So lies the poyson sin in the most low. *Donne.*

Moses burns and stamps the calf to powder, and gives it Israel to drink—that instead of going before Israel, it might pass through them; so as the next day they might find their god in their *excrements*; to the just shame of Israel. *Bp. Hall's Contemplations.*

Their sordid avarice rakes
In *excrements*, and hires the very jakes. *Dryden.*

Farce, in itself, is of a nasty scent;
But the gain smells not of the *excrement*. *Id.*

A diminution of the body happens by the *excretive* faculty, excerning and evacuating more than necessary. *Harvey on Consumptions.*

Toil of the mind destroys health, by attracting the spirits from their task of concoction to the brain; whither they carry along with them clouds of vapours and *excrementitious* humours. *Harvey.*

You may find, by dissection, not only their stomachs full of meat, but their intestines full of *excrement*. *Bentley.*

The lungs are the grand emunctory of the body; and the main end of respiration is continually to discharge and expel an *excrementitious* fluid out of the mass of blood. *Woodward.*

An animal fluid no ways *excrementitious*, mild, elaborated, and nutritious. *Arbuthnot on Aliments.*

The *excrements* of horses are nothing but hay, and, as such, combustible. *Id.*

The symptoms of the *excretion* of the bile vitiated, are a yellowish skin, white hard fæces, loss of appetite, and a lixivial urine. *Id.*

*Excretories* of the body are nothing but slender slips of the arteries, deriving an appropriate juice from the blood. *Cheyne*

Others have believed them *excretory* organs of *excrementitious* juices; but, as the vapour exhaled from vegetables has no taste, this idea is no more probable than the other; add to this, that in moist weather they do not appear to perspire or exhale at all. *Darwin.*

EXCREMENTS, in physiology, are properly those parts of the food which, after having undergone the process of digestion, are rejected and thrown out from the passages of the body adapted for their exclusion. This class embraces the urine and fæces: some writers also include the perspiration or sweat. Both the

perspiration and urine appear to be loaded with salts of various kinds, and to tinge linen with different shades of yellow; both redden blue paper, and both appear to contain phosphoric acid. Human urine, however, is peculiarly characterised in the possession of lithic acid, an acid secreted in no other animal than man; and which crystallises round the sides of the vessel in which it is deposited, in the form of red polygonal salts, vulgarly denominated red sand. It contains also a large quantity of extractive matter of a peculiar kind, denominated by the French chemists urée. The urine of animals that feed on vegetables alone is proved by Fourcroy to contain benzoic acid instead of phosphoric, and to hold a larger portion of extractive matter. From urine, nitre, ammonia, and its muriat are extracted, and it is greatly used in the scouring of woollen cloths. The dung of different animals is employed for a variety of important purposes. That of the herbivorous quadrupeds appears a mixture of bile, &c., with a considerable portion of the fibrous vegetable food. Hence, the great use of camels' dung in Arabia and Egypt as fuel. A considerable quantity of ammonia is produced by the burning of dung, from which, mixed with sea-salt, the earliest sal-ammoniac was obtained. Cow-dung is of no small use in the preparation of cloth, as it mixes with water, and possesses cleansing powers similar to those of soap. The fæces of dogs and carnivorous animals have a most powerful corroding effect upon animal substances when the putrid fermentation is established.

EXCRES'CENCE, or EXCRES'CENCY, *n. s.* EXCRES'CENT, *adj.* Fr. *excrescence, excroissance*; Ital. *escrescenza*; Span. and Port. *excrescencia*; Lat. *excrescentia, ab excrescere*, i. e. *extra crescere*.—Minsheu. An useless or monstrous growth or superfluity.

All beyond this is monstrous, 'tis out of nature, 'tis an *excrescence*, and not a living part of poetry. *Dryden.*

We have little more than the *excrescencies* of the Spanish monarchy. *Addison on the War.*

They are the *excrescences* of our souls; which, like our hair and beards, look horrid or becoming, as we cut or let them grow. *Tatler.*

Tumours and *excrescences* of plants, out of which generally issues a fly or a worm, are at first made by such insects which wound the tender buds. *Bentley.*

Expunge the whole or lop the *excrescent* parts
Of all, our vices have created arts;
Then see how little the remaining sum,
Which served the past, and must the times to come. *Pope.*

EXCRESCENCE, in surgery, a preternatural tumor upon the skin, either in the form of a wart or tubercle. If they are born with a person, as they frequently are, they are called nævi materni, or marks from the mother; but if the tumor is large, so as to depend from the skin, like a fleshy mass, it is then called a sarcoma. See SURGERY.

EXCRU'CIATE, *v. a.* EXCRU'CIATION. Lat. *excrucio, ex* and *crucio, crux, crucis*, a cross. To put to pain, torture, torment.

He (Socrates) wittingly did marry her to exercise his patience, that, by the practice of enduring her shrewish heats, he might be able to brook all companies; the brawls, the scorns, the sophisms, and the petulancies of rude and unskilful men; the frettings, the thwartings, and the *excruciations* of life. *Feltham.*

And here my heart long time *excruciate*,
Amongst the leaves I rested all that night. *Chapman.*

Leave them, as long as they keep their hardness and impenitent hearts, to those gnawing and *excruciating* fears, those whips of the Divine Nemesis, that frequently scourge even atheists themselves. *Bentley.*

I soon after was confined by a most *excruciating* disorder, and lost the use of my limbs. *Sheridan.*

A talking oracle of awful phrase,
The approving 'Good!' (by no means good in law)
Humming like flies around the newest blaze,
The bluest of blue bottles you e'er saw,
Teasing with blame, *excruciating* with praise,
Gorging the little fame he gets all raw,
Translating tongues he knows not even by letter,
And sweating plays so middling, bad were better. *Byron.*

EXCUBIÆ, in antiquity, the watches and guards kept in the day by the Roman soldiers, contradistinguished from the vigiliæ, which were kept in the night. The excubiæ were placed either at the gates and entrenchments, or in the camp; for the latter there was allowed a whole manipulus to attend before the prætorium, and four soldiers to the tent of every tribune. The excubiæ at the gates of the camp, and at the entrenchments, were properly called stationes. One company of foot and one troop of horse were assigned to each of the four gates every day.

EXCUL'PATE, *v. a.* EXCULPA'TION, *n. s.* EXCUL'PATORY, *adj.* Fr. *disculper*; Lat. *exculpo, ex* and *culpo, culpa*, a fault. To clear from blame, or charge. Exculpatory, is that which has the tendency to excuse or free from blame.

A good child will not seek to *exculpate* herself at the expence of the most revered characters. *Clarissa.*

By this fond and eager acceptance of an *exculpatory* comment, Pope testified that, whatever might be the seeming or real import of the principles which he had received from Bolingbroke, he had not intentionally attacked religion; and Bolingbroke, if he meant to attack him, without his own consent, an instrument of mischief, found him now engaged, with his eyes open, on the side of truth. *Johnson.*

EXCULPATION, LETTERS OF, in Scotch law, a writ or summons issued by authority of the court of justiciary, at the instance of a pannel, for citing witnesses to prove his defences, or his objections to any of the jury or witnesses cited against him.

EXCUR', *v. n.* EXCUR'SION, *n. s.* EXCUR'SIVE, *adj.* EXCUR'SIVELY, *adv.* Lat. *excurso, ex* from, and *curso*, to run; Fr. and Span. *excursion*; Italian, *excursione*. To pass beyond limits: the act of doing so; an expedition or digression beyond usual bounds; a ramble, or irregular journey.

Expect not that I should beg pardon for this *excursion*, till I think it a digression to insist on the blessedness of Christ in heaven. *Boyle's Seraph. Love.*

His disease was an asthma, oft *excurring* to an orthopnœia; the cause, a translation of tartarous humours from his joints to his lungs. *Harvey.*

The mind extends its thoughts often beyond the utmost expansion of matter, and makes *excursions* into that incomprehensible. *Locke.*

The causes of those great *excursions* of the seasons into the extremes of cold and heat, are very obscure. *Arbuthnot on Air.*

I am too weary to allow myself any *excursion* from the main design. *Atterbury.*

The muse whose early voice you taught to sing,
Prescribed her heights, and pruned her tender wing;
Her guide now lost, no more attempts to rise,
But in low numbers short *excursions* tries. *Pope.*

But why so far *excursive*, when at hand
Fair-handed Spring unbosoms every grace? *Thomson.*

Of animals which feed *excursively* [the flesh] is allowed to have a higher flavour than that of those who are couped up. *Boswell.*

EXCUSATI, in church history, slaves who, flying to any church for sanctuary, were excused and pardoned by their masters; but these were obliged to take an oath to that purpose before they could again obtain possession of them; and, if they broke the oath, they were punished and fined as persons guilty of perjury.

EXCUSE', *v. a.*, *n. s.* | EXCU'SABLE, *adj.* | EXCU'SABLENESS, *n. s.* | EXCU'SATION, | EXCU'SATORY, *adj.* | EXCUSE'LESS, *adj.* | EXCUS'ER, *n. s.* } Fr. *excuser*; Ital. *escusare*, *iscusare*, and *scuare*; Spanish and Port. *escusar*; Latin, *excusare*, i. e. *extra causam* (*ponere*), to place beyond or out of the cause. To extenuate; deliver from charge or obligation; to remit; pardon; vindicate. As a substantive, it means the act or plea of apology, or the cause for which one is excused. Excusation is synonymous with excuse as a substantive. Excusatory is apologetical. Excuser, he who pleads for, or pardons another.

And all bigunnen togider to *excuse* hem, the firste seyde: I haue bought a toun, and I haue nede to go out and se it, Y preie thee haue me *excusid*. *Wiclif. Luk.* 14.

If I hadde not come and hadde not spokun to hem thei schulden not haue synne, but now thei han noon *excusacioun* of her synne. *Id. Jon* 15.

Accusing or else *excusing* one another. *Romans.*

Be gone, I will not hear thy vain *excuse*;
But, as thou lov'st thy life, make speed from hence. *Shakspeare.*

Heaven put it in thy mind to take it hence,
That thou might'st win the more thy father's love,
Pleading so wisely in *excuse* of it. *Id. Henry IV.*

Not only that;
That were *excusable*, that and thousands more
Of semblable import. *Id. Antony and Cleopatra.*

As good success admits no examination, so the contrary allows of no *excuse*, how reasonable or just soever. *Raleigh.*

Learned men are *excusable* in particulars, whereupon our salvation dependeth not. *Id. History.*

Prefaces, *excusations*, and other speeches of reference to the person, though they seem to proceed of modesty, they are bravery. *Bacon's Essays.*

Bad men *excuse* their faults, good men will leave them;
He acts the third crime that defends the first. *Ben Jonson.*

For his intermeddling with arms he is the more *excusable*, because many others of his coat are commanders. *Howel.*

Laud attended throughout that whole journey, which he was not obliged to do, and no doubt would have been *excused* from it. *Clarendon.*

Goodness to be admired, that it refuted not his argument in the punishment of his *excusation*. *Browne.*

I was set upon by some of your servants, whom because I have in my just defence evil entreated, I came to make my *excuse* to you. *Sidney.*

Though he were already stept into the winter of his age, he found himself warm in those desires, which were in his son far more *excusable*. *Id.*

Let no vain hope your easy mind seduce;
For rich ill poets are without *excuse*. *Roscommon.*

I speak not of your innocent or *excusable* mistakes in cases of great difficulty, nor yet of *excusing* a cause bad in the main from unjust aggravations. *Baxter.*

It may satisfy others of the *excusableness* of my dissatisfaction, to peruse the ensuing relation. *Boyle.*

Before the Gospel, impenitency was much more *excusable*, because men were ignorant. *Tillotson.*

Nothing but love this patience could produce;
And I allow your rage that kind *excuse*. *Dryden.*

Children, afraid to have their faults seen in their naked colours, will, like the rest of the sons of Adam, be apt to make *excuses*. *Locke.*

Nor could the real danger of leaving their dwellings to go up to the temple, *excuse* their journey. *South.*

Thou, whoe'er thou art, *excuse* the force
These men have used; and O befriend our course! *Addison.*

We find out some *excuse* or other for deferring good resolutions, 'till our intended retreat is cut off by death. *Id.*

The voluntary enslaving myself is *excuseless*. *Decay of Piety.*

*Excuse* some courtly strains,
No whiter page than Addison's remains. *Pope.*

An *excuse* is more terrible than a lie; for an *excuse* is a lie guarded. *Id.*

In vain would his *excusers* endeavour to palliate his enormities, by imputing them to madness. *Swift.*

When we would impose upon God and our consciences, we *excuse* and disguise with all imaginable artifice and sophistry. *Mason.*

He had himself nothing to shew. It was now my turn. I made some difficulty; seemed as if I wished to be *excused*; pretended that I had no time to make corrections, &c. *Franklin.*

But if this plea 's denied, in our *excuse*,
Another still remains you can't refuse;
It is a lady writes. *Sheridan.*

EXCUSS, *v. a.* | EXCUS'SION, *n. s.* } Lat. *excussus*. To seize and detain by law: legal seizure.

If upon an *excussion* there are not goods to satisfy the judgment, his body may be attached. *Ayliffe.*

The person of a man ought not, by the civil law, to be taken for a debt, unless his goods and estate have been first *excussed*. *Id. Parergon.*

EX'ECRATE, *v. a.* | EX'ECRABLE, *adj.* | EX'ECRABLY, *adv.* | EXECRA'TION, *n. s.* } Fr. *execrer*; Ital. *esecrare*, *essecrare*; Span. and Port. *execrar*; Lat. *execrari*, of *ex*, privative, and *sacrare*, to make holy. To curse; to pronounce evil upon; detest.

Of the visible church of Jesus Christ those may be, in respect of their outward profession, who, in regard of their inward disposition, are most worthily both hateful in the sight of God himself, and in the

eyes of the sounder parts of the visible church most *execrable*. *Hooker.*

Give sentence on this *execrable* wretch,
That hath been breeder of these dire events. *Shakspeare.*

Mischance and sorrow go along with you,
And threefold vengeance 'tend upon your steps!
—Cease, gentle queen, these *execrations*. *Id.*

For this we may thank Adam! but his thanks
Shall be the *execration*. *Milton's Paradise Lost.*

The Indians, at naming the devil, did spit on the ground in token of *execration*. *Stillingfleet.*

Extinction of some tyranny, by the indignation of a people, makes way for some form contrary to that which they lately *execrated* and detested. *Temple.*

As for Pilate's personal qualities; such a person deserved to bear the guilt of a fact so *execrably* base; was worthy to be employed therein, and ready enough to undergo it. *Barrow.*

When *execrable* Troy in ashes lay,
Through fires, and swords, and seas, they forced their way. *Dryden.*

Furies! rise,
And drown, in your less *execrable* yell,
Britannia's shame. *Young.*

Well! divines may say of it what they please, but *execration* is to the mind what phlebotomy is to the body: the vital sluices of both are wonderfully relieved by their respective evacuations. *Burns.*

She *execrates* indeed
The tyranny that doomed them to the fire,
But gives the glorious sufferers little praise. *Cowper.*

EXECRATION, in antiquity, a kind of punishment, consisting of direful curses and marks of infamy; such was that used against Philip of Macedon by the Athenians. A general assembly of the people being called, they made a decree, that all the statues and images of that king, and of all his ancestors, should be demolished, and their very name razed; that all the festivals, sacred rites, priests, and whatever else had been instituted in honor of him, should be profaned; that the very places where there had been any monument or inscription to his honor, should be detestable; that nothing should be set up, or dedicated in them, which could be done in clean places; and, lastly, that the priests, as often as they prayed for the Athenian people, allies, armies, and fleets, should as many times detest and execrate Philip, his children, kingdom, land and sea forces, and the whole race and name of the Macedonians. At the taking and demolishing of cities, it was usual amongst the Greeks and Romans to pronounce curses upon, and load with direful execrations, the rebuilders of them.

EXE'CT, *v. a.* } Lat. *execo*. To cut out;
EXE'CTION, *n. s.* } to cut away. The act of cutting out.

Were it not for the effusion of blood which would follow an *exection*, the liver might not only be *exected*, but its office supplied by the spleen and other parts. *Harvey on Consumptions.*

EX'ECUTE, *v. a.* & *v. n.* } Fr. *executer*; Ital. *essequire*, *essecutare*; Span. and Port. *executar*, *esecutar*; Lat. *exequor*, from *ex*, expletive, and *sequor*, to follow. To perform; bring into action or completion; put to death: as a neuter verb, to perform an expected office or service: executer or executor is he who performs or accomplishes a thing; the legal trustee under a will; it has been sometimes used as synonymous with executioner, or he that inflicts capital punishment, and vice versâ; executioner is also used for the instrument whereby any thing is punished or performed: executorship is the office of trustee under a will: executrix a female appointed to such trust: executive, active, not deliberative or legislative; having power to carry laws or government into practice.
EXECU'TER, or
EXEC'UTOR, *n. s.*
EXEC'UTORSHIP,
EXECU'TION,
EXECU'TIONER,
EXEC'UTIVE,
EXEC'UTRIX,

Against all the gods of Egypt I will *execute* judgment. *Exodus.*

Men may not devise laws, but are bound for ever to use and *execute* those which God hath delivered. *Hooker.*

Fitzosborn was *executed* under him, or discarded into foreign service for a pretty shadow of exilement. *Spenser.*

My sweet mistress
Weeps when she sees me work, and says such baseness
Had ne'er like *executer*. *Shakspeare.*

I like thy counsel; and how well I like it,
The *execution* of it shall make known. *Id.*

Brave Macbeth with his brandished steel,
Which smoked with bloody *execution*,
Carved out his passage. *Id.*

Is not the causer of the timeless deaths,
As blameful as the *executioner?* *Id.*

I would not be thy *executioner*:
I fly thee, for I would not injure thee;
Thou tell'st me there is murder in mine eyes. *Id.*

The sad-eyed justice, with his surly hum
Delivers o'er to *executers* pale
The lazy yawning drone. *Id. Henry V.*

The treacherous Fastolfe wounds my peace,
Whom with my bare fists I would *execute*,
If I now had him. *Id. Henry VI.*

I wish no better
Than have him hold that purpose, and to put it
In *execution*. *Id. Coriolanus.*

For fishing for testaments and *executerships* it is worse, by how much men submit themselves to mean persons, than in service. *Bacon.*

It is a comfort to the *executioners* of this office, when they consider that they cannot be guilty of oppression. *Id.*

He did, after the death of the earl, buy of his *executrix* the remnant of the term. *Id.*

When things are come to the *execution*, there is no secrecy comparable to celerity. *Id. Essays.*

Sir William Bremingham was *executed* for treason. *Davies.*

The cannon against St. Stephen's gate *executed* so well, that the portcullis and gate were broken, and entry opened into the city. *Sir J. Hayward.*

The *execution* had been too cruel, and far exceeding the bounds of ordinary hostility. *Id.*

What are we the better for God's own laws, without *execution?* *Bp. Hall.*

To have seen them struck dead upon the earth had been fearful; but to see the earth at once their *executioner* and grave was more horrible. *Bp. Hall's Contemplations.*

Sir Richard was committed to the Fleet in *execution* for the whole six thousand pounds. *Clarendon.*

He, born of the greatest blood, submitted himself to be servant to the *executioner* that should put to death Musidorus. *Sidney.*

They are the nimblest, agil, strongest instruments, fittest to be *executive* of the commands of the souls. *Hale.*

O Tyburn, could'st thou reason and dispute,
Could'st thou but judge as well as *execute*,
How often would'st thou change the felon's doom,
And truss some stern chief justice in his room! *Dryden.*

The excellency of the subject contributed much to the happiness of the *execution*. *Id.*

Absalom pronounced sentence of death against his brother, and had it *executed* too. *Locke.*

Legislators not being able to foresee, and provide by laws, for all that may be useful to the community, the *executor* of the laws, having the power in his hands, has by the common law of nature a right to make use of it for the good of the society, in many cases where the municipal law has given no direction, till the legislative can conveniently be assembled to provide for it. *Id.*

Where the legislative and *executive* power are in distinct hands (as they are in all moderated monarchies and well framed governments), there the good of the society requires that several things should be left to the discretion of him that has the *executive* power. *Id.*

In this case every man hath a right to punish the offender, and be the *executioner* of the law of nature. *Id.*

He casts into the balance the promise of a reward to such as should *execute*, and of punishment to such as should neglect their commission. *South.*

When the tongue is the weapon, a man may strike where he cannot reach, and a word shall *do execution* both further and deeper than the mightiest blow. *Id.*

The Roman emperors were possessed of the whole legislative as well as *executive* power. *Addison.*

All along
The walls, abominable ornaments!
Are tools of wrath, anvils of torments hung,
Fell *executioners* of foul intents. *Crashaw.*

The heart of every man was in the hand of God, and he could have made them *executioners* of his wrath upon one another. *Woodward's Natural History.*

Laws support those crimes they checkt before,
And *executions* now affright no more. *Creech.*

O fate of fools! officious in contriving;
In *executing* puzzled, lame, and lost. *Congreve.*

Ships of such height and strength, that his vessels could do no *execution* upon them. *Arbuthnot.*

Sophocles and Euripides, in their most beautiful pieces, are impartial *executers* of poetick justice. *Dennis.*

Hobbes confounds the *executive* with the legislative power, though all well instituted states have ever placed them in different hands. *Swift.*

The government here is so regularly disposed, that it almost *executes* itself. *Id.*

Know I am but *executor*; he left
This moral legacy; I make it o'er
By his command. *Young.*

Every sort of legislative, judicial, or *executory* power are its creatures. They can have no being in any other state of things; and how can any man claim, under the conventions of civil society, rights which do not so much as suppose its existence? *Burke.*

When this great revolution was attempted in a more regular mode by government, it was opposed by plots and seditions of the people; when by popular efforts, it was repressed as rebellion by the hand of power; and bloody *executions* (often bloodily returned) marked the whole of its progress through all its stages. *Id.*

It works the coupoirs or screw-presses for cutting out the circular pieces of copper; and coins both the faces and edges of the money at the same time, with such superior excellence and cheapness of workmanship, as well as with marks of such powerful machinery as must totally prevent clandestine imitation, and in consequence save many lives from the hand of the *executioner*; a circumstance worthy the attention of a great minister. *Darwin.*

An actor is in the capacity of a steward to every living muse, and of an *executor* to every departed one: the poet digs up the ore; he sifts it from the dross, refines and purifies it for the mint: the actor sets the stamp upon it, and makes it current in the world. *Cumberland.*

Execution, in criminal cases, follows judgment; and must in all cases, capital as well as otherwise, be performed by the legal officer, the sheriff or his deputy; whose warrant for so doing was anciently by precept, under the hand and seal of the judge, as it is still practised in the court of the lord high steward upon the execution of a peer; though, in the court of the peers in parliament, it is done by writ from the king. Afterwards it was established, that in case of life, the judge may command execution to be done without any writ. The usage now is, for the judge to sign the list of all the prisoners' names, with their separate judgments in the margin, which is left with the sheriff. As, for a capital felony, it is written opposite to the prisoner's name, 'let him be hanged by the neck;' formerly, in the days of Latin and abbreviation, 'sus. per coll.,' for 'suspendatur per collum.' And this is the only warrant that the sheriff has for so material an act as taking away the life of another. Upon this, Blackstone observes, it may certainly afford matter of speculation, that in civil causes there should be such a variety of writs of execution to recover a trifling debt, issued in the king's name, and the seal of the court, without which the sheriff cannot legally stir one step: and yet that the execution of a man, the most important and terrible task of any, should depend upon a marginal note. The sheriff, upon receipt of his warrant, is to do execution within a convenient time, which in the country is also left at large. In London, indeed, a more solemn and becoming exactness is used, both as to the warrant of execution and the time of executing thereof; for the recorder, after reporting to the king, in person, the case of the several prisoners, and receiving his royal pleasure, that the law must take its course, issues his warrant to the sheriffs, directing them to do execution on the day and at the place assigned. And in the court of king's bench, if the prisoner be tried at the bar, or brought there by habeas corpus, a rule is made for his execution, either specifying the time and place, or leaving it to the discretion of the sheriff. And throughout the kingdom, by stat. 25 Geo. II., cap. 37, it is enacted that, in case of murder, the judge shall, in his sentence, direct execution to be performed on the next day but one after sentence is passed. But otherwise, the time and place of execution are by law no part of the judgment. It has been well observed, that it is of great importance that the punishment should follow the crime as early as possible; that the prospect of gratification or

advantage which tempts a man to commit the crime, should instantly awake the attendant idea of punishment. Delay of execution serves only to separate these ideas; and then the execution itself affects the minds of the spectators rather as a terrible sight, than as the necessary consequence of transgression. Sir Edward Coke and Sir Matthew Hale say, that even the king cannot change the punishment of the law, by altering the hanging or burning into beheading; though, when beheading is part of the sentence, the king may remit the rest. But others have thought, and more justly, that this prerogative, being founded on mercy, and immemorially exercised by the crown, is part of the common law. For hitherto, in every instance, all these exchanges have been for more merciful kinds of death; and, how far this may also fall within the king's power of granting conditional pardons, viz. by remitting a severe kind of death, on condition that the criminal submits to a milder, is a matter that may bear consideration. When lord Stafford was executed for the popish plot in the reign of king Charles II., the then sheriffs of London having received the king's writ for beheading him, petitioned the house of lords for an order how the said judgment should be executed; for he, being prosecuted by impeachment, they entertained a notion, which is said to have been countenanced by lord Russel, that the king could not pardon any part of the sentence. The lords resolved, that the scruples of the sheriffs were unnecessary, and declared that the king's writ ought to be obeyed. Disappointed of raising a flame in that assembly, they immediately signified to the house of commons, by one of the members, that they were not satisfied as to the power of the said writ. The house took two days to consider of it, and then sullenly resolved, that the house was content that the sheriff do execute lord Stafford by severing his head from his body. It is farther related, that when afterwards the same lord Russel was condemned for high treason, upon indictment, the king, while he remitted the ignominious part of the sentence, observed, 'that his lordship would now find that he was possessed of the prerogative, which in the case of lord Stafford he had denied him.'

The policy of public executions for any offence short of the crime as murder has now become so questionable as to materially diminish their number, and we have little doubt but that that portion of our criminal law which condemns a human being to a cruel and ignominious death for obtaining money by a forged bill of exchange, will speedily be erased from the statute book. Nay, we are convinced that sound policy as well as humanity sanction the change.—If our laws were less like those of Draco, a greater number of criminals would be prosecuted to conviction.

Execution, military, includes every kind of punishment inflicted on the army by the sentence of a court-martial; such as tying up to three halberts, and receiving a number of lashes with a whip, composed of nine whip-cord lashes, and each lash of nine knots, from the drummer; or running the gantelope through the parade at guard-mounting, drawn up in two lines for that purpose; when the provost marches through with twigs or switches, and every soldier takes as many as there are prisoners to be punished; the prisoner then marches through the two lines, and each soldier gives him a hard stroke, the major riding up and down to see that the men lay on properly. When a soldier is to be punished with death, a detachment of about 200 men from the regiment to which he belongs, form the parade, when a file of grenadiers shoot the prisoner to death. Every nation has different modes of punishment. The cat with nine tails is to punish foot soldiers; dragoons and cavalry men are generally picketed.

Executions, in civil actions or where money only is recovered, as a debt or damages, are of five sorts. 1. Against the body of the defendant. 2. Against his goods and chattels. 3. Against his goods and the profits of his lands. 4. Against his goods and the possession of his lands. 5. Against all three, his body, lands, and goods.

1. The first of these species of execution is by writ of capias ad satisfaciendum (shortly called a ca. sa.) to take and imprison the body of the debtor till satisfaction be made for the debt, costs, and damages. Sir E. Coke gives a singular instance where a defendant in 14 Edw. III. was discharged from a capias because he was of so advanced an age that he could not undergo the pain of imprisonment. 1 Inst. 289. This writ is an execution of the highest nature, inasmuch as it deprives a man of his liberty till he makes the satisfaction awarded; and, therefore, when a man is once taken in execution upon this writ, no other process can be sued out against his lands or goods. Only by stat. 21 Jac. I. c. 24, if the defendant dies while charged in execution upon this writ, the plaintiff may, after his death, sue out a new execution against his lands, goods, or chattels. If a ca. sa. is sued out, and a non est inventus is returned thereon, the plaintiff may sue out a process against the bail, if any were given; who stipulated in this triple alternative, that the defendant shall, if condemned in the suit, satisfy the plaintiff his debt and costs, or surrender himself a prisoner; or that they will pay it for him: as therefore the two former branches of the alternative are neither of them complied with, the latter must immediately take place. Lutw. 1269, 1273. In order to which a writ of scire facias may be sued out against the bail, commanding them to show cause why the plaintiff should not have execution against them for his debt and damages; and on such writ, if they show no sufficient cause, or the defendant does not surrender himself on the day of the return, or of showing cause, the plaintiff may have judgment against the bail, and take out a writ of ca. sa. or other process of execution against them.

2. The next species of execution is against the goods and chattels of the defendant, and is called a writ of fieri facias, from the words in it where the sheriff is commanded that he cause to be made of the goods and chattels of the defendant, the sum or debt recovered. This lies as well against privileged persons, peers, &c., as

other common persons; and against executors or administrators, with regard to the goods of the deceased. The sheriff may not break open any outer doors to execute either this writ or the writ of ca. sa. but must enter peaceably; and may then break open any inner door belonging to the defendant, in order to take the goods. 5 Rep. 92. Palm. 54. See post, III. 3. And the sheriff may sell the goods and chattels of the defendant, even an estate for years, which is a chattel real (8 Rep. 171), till he has raised enough to satisfy the judgment and costs; first paying the landlord of the premises upon which the goods are found, the arrears of rent then due, not exceeding one year's rent in the whole. Stat. 8 Ann. c. 14. If part only of the debt be levied on a fieri facias, the plaintiff may have a ca. sa. for the residue. 1 Ro. Ab. 904. Cro. Eliz. 344.

3. A third species of execution is by writ of levari facias; which affects a man's goods, and the profits of his lands, by commanding the sheriff to levy the plaintiff's debt on the lands and goods of the defendant; whereby the sheriff may seize all his goods, and receive the rents and profits of his lands, till satisfaction be made to the plaintiff. Finch, L. 471. Little use is now made of this writ; the remedy by elegit, which takes possession of the lands themselves, being much more effectual. But, as a species of this levari facias may be considered a writ of execution proper only to ecclesiastics, which is given when the sheriff, upon a common writ of execution sued, returns that the defendant is a beneficed clerk, having no lay fee. In this case a writ goes to the bishop of the diocese, in the nature of a levari or fieri facias, to levy the debt and damages de bonis ecclesiasticis, which are not to be touched by lay hands: and thereupon the bishop sends out a sequestration of the profits of the clerk's benefice, directed to the churchwardens to collect the same, and pay them to the plaintiff till the full sum be raised. Reg. Orig. 300. Burn E. L. 329. 2 Inst. 472. Jenk. 207

4. The fourth species of execution is by the writ of elegit, which is a judicial writ given by stat. Will. II. 13, Edw. I. c. 18, either upon judgment for a debt or damages, or upon the forfeiture of a recognisance taken in the king's court. By the common law, a man could only have satisfaction of goods, chattels, and the present profits of lands, by the two writs of execution last-mentioned (2 and 3); but not the possession of the lands themselves, which was a natural consequence of the feudal principles prohibiting alienation of lands. See TENURE. By this writ of elegit the defendant's goods and chattels are not sold, but only appraised; and all of them, except oxen and beasts of the plough, are delivered to the plaintiff at such reasonable appraisement and price, in part of satisfaction of his debt. If the goods are not sufficient, then the moiety, or one half of his freehold lands, which he had at the time of the judgment given, whether held in his own name or any other in trust for him, are also to be delivered to the plaintiff: to hold till out of the rents and profits thereof the debt be levied, or till the defendant's interest be expired; as till the death of the defendant, if he be tenant for life, or in tail. This execution, or seizing of lands by elegit, is of so high a nature, that after it the body of the defendant cannot be taken: but if execution can only be had of the goods because there are no lands, and such goods are not sufficient to pay the debt, a ca. sa. may then be had after the elegit; for such elegit is in this case no more in effect than a fieri facias. Hob. 58.

5. Thus it appears that body and goods may be taken in execution; or land and goods; but not body and lands too upon any judgment between subject and subject, in the course of the common law; but, upon some prosecutions given by statute; as in the case of recognisances or debts acknowledged on statute merchant, or statute staple (see stat. 13 Edw. I. de mercatoribus; 27 Edw. III. c. 9.) upon forfeiture of these the body, lands, and goods may all be taken at once in execution to compel the payment of the debt. The process hereon is usually called an extent or extendi facias; because the sheriff is to cause the lands, &c., to be appraised to their full extended value, before he delivers them to the plaintiff, that it may be certainly known how soon the debt will be satisfied. F. N. B. 131.

By stat. 33 Hen. VIII. c. 39, all obligations made to the king shall have the same force, and of consequence the same remedy to recover them, as a statute-staple; though, indeed, before this statute, the king was entitled to sue out execution against the body, lands, and goods of his accountant or debtor. 3 Rep. 12. And his debt shall, in suing out execution, be preferred to that of every other creditor who hath not obtained judgment before the king commenced his suit. Stat. 33 Hen. VIII. c. 39, sec. 74. The king's judgment also affects lands which the king's debtor hath at or after the time of contracting his debt, or which any of his officers mentioned in stat. 13 Eliz. c. 4, hath at or after the time of his entering on the office: so that if such officer of the crown aliens for a valuable consideration, the land shall be liable to the king's debt, even in the hands of a bonâ fide purchaser: though the debt due to the king was contracted by the vendor many years after the alienation. 10 Rep. 55, 6, 8 Rep. 171. And see stat. 25 Geo. III. c. 35, which enables the Court of Exchequer, on application by the attorney general by motion, to order the estate of any debtor to the king, and of the heirs and assigns of such debtor, in any lands extended, to be sold as the court shall direct; the conveyance to be made by the remembrancer of the court, by bargain and sale, to be inrolled in that court.

Judgments between subject and subject related, even at common law, no farther back than the first day of the term in which they were recovered, in respect of the lands of the debtor; and did not bind his goods and chattels but from the date of the writ of execution: and now by the statute of frauds, 29 Car. II., c. 3, the judgment shall not bind the land in the hands of a bonâ fide purchaser, but only from the day of actually signing the same, which is directed by the statute to be punctually entered on the re-

cord: nor shall the writ of execution bind the goods in the hands of a stranger or a purchaser, (Skin. 257) but only from the actual delivery of the writ to the sheriff or other officer, who is, therefore, ordered to indorse on the back of it the day of his receiving the same.

Executive Power. The supreme executive power of these kingdoms is vested by our laws in the king or queen for the time being, who has a right to a negative in parliament, i. e. to refuse assent to any bill offered. See England.

Executor, in English law, is one appointed by a man's last will and testament to perform or execute the contents thereof after his decease; and to have the disposing of all the testator's substance, according to the tenor of the will. Under the term Will we shall have to consider the legal form and character of that important instrument. In this place we propose only to point out who may be executors, the nature of the appointment, the interest vested in them, and the general duties of their office.

1. No person *can act* as executor under the age of seventeen years; till which time administration must be granted to some other durante minore ætate. And if the right of administration devolves on an infant, administration durante minore ætate is to be granted till he arrives at twenty-one. But such administrator is but a curator for the infant, and has no interest or benefit in the testator's or intestate's estate, but in right of the infant. If an infant and one of full age, are made executors, he who is of full age may take out administration durante minori ætate of the infant, and may declare as executor or administrator durante minori ætate: and there is no absurdity in this case, that there should be an executor and administrator to the same party. In like manner as it may be granted durante absentiâ pendente lite; when the executor is out of the realm; or 1 Lutw. 342; or when a suit is commenced in the Ecclesiastical court, touching the validity of the will. 2. P. Wms. 589, 590.

2. The *appointment* of an executor is essential to the making of a will: Went. c. 1. Plowd. 281; and it may be performed either by express words, or such as strongly imply the same: but if the testator makes an incomplete will, without naming any executors; or, if he names incapable persons; or if the executors named refuse to act, see 9 Rep. 37. Went. Off. Ex. 38; in any of these cases administration must be granted cum testamento annexo to some other persons; 1 Rol. Ab. 907; Comb. 20; and then the duty of the administrator, as also when he is constituted only durante minore ætate, &c., is very little different from that of an executor. A man may also appoint two or more persons to be joint executors, and they are accounted in law but as one person. See post. v. 3. 5.—Such joint executors shall not be charged by the acts of their companions; any further than for effects actually come to their hands. Moor. 620. Cro. Eliz. 318. 2 Leon. 209. But if two or more executors join in a receipt (in writing) and one of them only actually receives the money, each is liable for the whole as to creditors at law, but not as to legatees, or next of kin. 1 Salk. 318. If joint executors, by agreement among themselves, agree that each shall intermeddle with a certain part of the testator's estate, yet each shall be chargeable for the whole (to creditors) by agreeing to the other's receipts. Hard. 314.

3. The *interest* vested in the executor, by the will of the deceased, may be continued and kept alive by the will of the same executor; so that the executor of A's executor is to all intents and purposes the executor and representative of A himself; see 25 Ed. III. st. 5. c. 5. 1 Leon. 275. But the executor of A's administrator, or the administrator of A's executor, is not the representative of A. For the power of an executor is founded upon the special confidence and actual appointment of the deceased; and such executor is therefore allowed to transmit that power to another, in whom he hath equal confidence: but the administrator of A is merely the officer of the ordinary, prescribed to him by act of parliament, in whom the deceased has reposed no trust at all; and therefore, on the death of that officer, it results back to the ordinary to appoint another. And, with regard to the administrator of A's executor, he has clearly no privity or relation to A; being only commissioned to administer the effects of the intestate executor, and not of the original testator. Wherefore in both these cases, and whenever the course of the representation from executor to executor is interrupted by any one administration, it is necessary for the ordinary to commit administration afresh, of the goods of the deceased, not administered by the former executor or administrator. And this administrator, de bonis non, is the only legal representative of the deceased in matters of personal property. But he may, as well as an original administrator, have only a limited or special administration committed to his care, viz. of certain specific effects, such as a term of years and the like; the rest being committed to others. 1 Roll. Abr. 908. Godolph. p. 2. c. 30. Salk. 36. 1 New. Abr. 385.

If an executor dies before probate, such an executor's executor cannot prove the will, because he is not named therein, and no one can prove a will but he who is named executor in it: but if the first executor had proved the will, then his executor might have been executor to the first testator, there requiring no new probate. 1 Salk, 299. Though an executor of an executor may thus be executor to the first testator, yet he may take upon him the executorship of his own testator, and refuse to intermeddle with the estate of the other; and if the first executor refuses (as if he dies before probate) his executor shall not administer to the first testator.

4. The *duty* and *office* of executors and administrators in general are very much the same; excepting, first, that the executor is bound to perform a will, which an administrator is not, unless where a testament is annexed to his administration, and then he differs still less from an executor: and secondly, that an executor may do many acts before he proves the will Wentw. ch. 3. but an administrator may do nothing till letters of administration are issued; for the former derives his power from the will, and not from the probate; the latter owes his entirely to the appointment of the ordinary. Com. 51.

If a stranger takes upon him to act as executor, without any just authority (as by intermeddling with the goods of the deceased, 5 Rep. 33, 34. and many other transactions, Wentw. ch. 14. Stat. 43. Eliz. c. 8), he is called in law an executor of his own wrong (de son tort,) and is liable to all the trouble of an executorship, without any of the profits or advantages; but merely doing acts of necessity or humanity, as locking up the goods, or burying the corpse, of the deceased will not amount to such an intermeddling, as will charge a man as executor of his own wrong. Dyer, 166. When there is a rightful executor, and a stranger possesses himself of the testator's goods, without doing any further act as executor, he is not an executor de son tort, but a tresspasser, Dyer, 105. Rol. Abr. 918. See 5 Rep. 82. An executor of his own wrong may be sued as executor; and he shall be sued for legacies as well as a rightful executor. Noy, 13. Though an executor de son tort cannot maintain any suit or action, because he cannot produce any will to justify it, yet he will be severely punished for a false plea; for in such case the execution shall be awarded for the whole debt, though he meddled with a thing of very small value. Noy, 69. What acts make a person liable as executor de son tort, is a question of law; the jury are to say whether the acts be sufficiently proved.

i. The executor or administrator must bury the deceased in a manner suitable to the estate which he leaves behind him. Necessary funeral expenses are allowed, previous to all other debts and charges; but if the executor or administrator be extravagant, it is a species of devastation or waste of the substance of the deceased; and shall only be prejudicial to himself, and not to the creditors or legatees of the deceased.

ii. The executor or administrator durante minore ætate, or durante absentiâ, or cum testamento annexo, must prove the will of the deceased; which is done either in a common form, which is only upon his own oath before the ordinary, or his surrogate; or per testes, in more solemn form of law, in case the validity of the will be disputed. Godolph. p. 1. c. 20. § 4. When the will is so proved, the original must be deposited in the register of the ordinary: and a copy thereof, in parchment, is made out under the seal of the ordinary, and delivered to the executor or administrator, together with a certificate of its having been proved before him: all which together is usually styled the probate. By stat. 37 Geo. III. c. 90, the executor must take probate within six months on penalty of £80.

iii. An executor may refuse an executorship; but the refusal ought to be before the ordinary. If an executor be summoned to accept or refuse the executorship, and he doth not appear on the summons, and prove the will, the court may grant administration, &c., which shall be good in law till such executor hath proved the will; but no man can be compelled to take on him the executorship, unless he hath intermeddled with the state. 1 Leon 154. Cro. Eliz. 858. Where there are several executors, and they all refuse, none of them shall administer afterwards; but if there is a refusal by one, and the other proves the will, the refusing executor may administer when he will during the life of his co-executor. 1 Rep. 28. If there is but one executor, and he administer, he cannot refuse afterwards; and if once he refuse, he cannot administer afterwards: thus, when a testator being possessed of lands, &c., for a term of years, and devised the same to the chief justice Catline, and made him executor, and died; afterwards the executor wrote a letter to the judge of the prerogative court, intimating that he could not attend the executorship, and desiring him to grant administration to the next of kin to the deceased, which was done accordingly; and after this the executor entered on the lands, and granted the term to another; it was adjudged void, because the letter which he wrote was a sufficient refusal; and he may not, after refusal, take upon him the executorship. Moor, 272.

As the testator has thought the executor appointed a proper person to be entrusted with his affairs, the ordinary cannot adjudge him disable or incapax; but a mandamus shall issue from B.R. for the ordinary to grant probate of the will, and admit the executor, if he refuse him: neither can the ordinary insist upon security from the executor, as the testator has thought him able and qualified. 1 Salk. 299. And although an executor becomes bankrupt, yet it is said the ordinary cannot grant administration to another; but if an executor become non compos, the spiritual court may commit administration for this natural disability.

iv. The executor or administrator is to make an inventory of all the goods and chattels, whether in possession or action of the deceased, which he is to deliver in to the ordinary upon oath, if thereunto lawfully required. Stat. 21 H. 8. c. 5. By stat. 1 Jac. II. c. 17 § 6, no administrator shall be cited into court to render an account of the personal estate of his intestate, otherwise than by an inventory thereof, unless at the instance of some person in behalf of a minor, or having a demand out of such estate as a creditor, or next of kin; nor shall be compellable to account before any ordinary or judge empowered by the act of 22 & 23 Car. II. cap. 10, otherwise than as aforesaid. See 9 Rep. 30. 2 Inst. 600. Raym. 407.

v. He is to collect all the goods and chattels so inventoried; and to that end he has very large powers and interests conferred on him by law, being the representative of the deceased; Co. Lit. 209; and having the same property in his goods as the principal had when living, and the same remedies to recover them. And if there be two or more executors, a sale or release by one of them shall be good against all the rest, Dyer 23. Cro. Eliz. 347. Sid. 33. Brownl. 183, unless such release be obtained by fraud.

If goods of the testator are kept from the executor, he may sue for them in the spiritual court, or at common law; and if one seized of a messuage in fee, &c., has goods in the house, and makes a will and executors, and dies, the executors may enter into the house, and carry away the goods. Lit. 60. An executor may, in convenient time after the testator's death, enter into a house descended to the heir, for removing and

carrying away the goods, so as the door be open, or the key be in the door. Offic. Exec. 8. He may take the goods and chattels to himself, or give power to another to seize them for him, 9 Rep. 38. If an executor with his own goods redeem the goods of the testator; or pays the testator's debts, &c., the goods of the testator shall, for so much, be changed into the proper goods of the executor. Jenk. Cent. 188. Where a man by will devises that his lands shall be sold for payment of debts, his executors shall sell the land, to whom it belongs to pay the debts. 2 Leon. c. 276. And if lands are devised to executors to be sold for payment of the testator's debts, those executors that act in the executorship, or that will sell, may do it without the others. Co. Lit. 113. By stat. 21 H. VIII. c. 4, bargains and sales of lands, &c., devised to be sold by executors, shall be as good, if made by such of the executors only as take upon them the execution of the will, as if all the executors had joined in the sale. If lands are thus devised to pay debts, a surviving executor may sell them; but if the devise be, that the executor shall sell the land, and not of the land to them to be sold, here being only an authority, not an interest; if one dies, the other cannot sell.

vi. The executor or administrator must pay the *debts* of the deceased. In payment of debts he must observe the rules of priority; otherwise, on deficiency of assets, if he pay those of a lower degree first, he must answer those of a higher out of his own estate. And, first, he must pay all funeral charges, and the expenses of proving the will, and the like. Secondly, debts due to the king on record or speciality. 1 And. 129. Thirdly, such debts as are by particular statutes to be preferred to all others; money due upon poor rates (stat. 17 Geo. II. c. 38), for letters to the post-office (stat. 9 Ann. c. 10), and some others. See Will. Fourthly, debts of record; as judgments (docquetted according to the stat. 4 & 5 W. & M. c. 20), statutes, and recognizances. (4 Rep. 60 Cro. Car. 363). Fifthly, debts due on special contracts: as for rent (for which the lessor has often a better remedy in his own hands by distraining); or upon bonds, covenants, and the like under seal. Wentw. ch. 12.) Lastly, debts on simple contracts, viz. upon notes unsealed and verbal promises. Among these simple contracts, servants' wages are by some (1 Rol. Abr. 927), with reason preferred to any other: and so stood the ancient law according to Bracton (lib. 2, c. 26), and Fleta (b. 2, c. 56 § 10). Among debts of equal degree, the executor or administrator is allowed to pay himself first; by retaining in his hands so much as his debt amounts to. 10 Mod. 496. If a creditor constitutes his debtor his executor, this is a release or discharge of the debt, whether the executor acts or not, provided there be assets sufficient to pay the testator's debts: for, though this discharge of the debt shall take place of all legacies, yet it were unfair to defraud the testator's creditors of their just debts by a release which is absolutely voluntary. Salk. 303. 1 Rol. Abr. 921. 5 Rep. 30. 8 Rep. 136.

vii. When the debts are discharged, the legacies claim the next regard; which are to be paid by the executor so far as his assets will extend; but he may not give himself the preference herein, as in the case of debts. 2 Vern. 434. 2 P. Wms. 25.—The assent of an executor to legacies is held necessary to entitle a legatee; but as this assent may be compelled, see March, 97, it does not seem necessary to state the effect of a dissent where there are assets sufficient to answer both debts and legacies. Where there are not assets, the assent of the executor of the legacy would subject him to a devastavit.

viii. When all the debts and particular legacies are discharged, the surplus or residuum must be paid to the residuary legatee, if any be appointed by the will; and if there be none, it was long a settled notion that it devolved to the executor's own use, by virtue of his executorship. Perkins, 525. But, whatever ground there might have been formerly for it, this opinion seems now to be understood, with the following restriction: that although, where the executor has no legacy at all, the residuum shall in general be his own; yet wherever there is sufficient on the face of a will (by means of a competent legacy or otherwise), to imply that the testator intended his executor should not have the residue, the undivided surplus of the estate shall go to the next of kin, the executor then standing upon exactly the same footing as an administrator.

EXECUTRY, in Scotch law, is the moveable estate falling to the executor. Under executry, or moveables, is comprehended every thing that moves itself, or can be moved; such as corn, cattle, furniture, ready money, &c.

EXEDRÆ, in antiquity, halls with many seats, where the philosophers, rhetoricians, and men of learning, met for discourse and disputation. The word occurs in ecclesiastical writers as a general name for such buildings as were distinct from the main body of the churches, and yet within the limits of the church, taken in its largest sense. Among the exedræ the chief was the baptistery.

EXEGE'SIS, *n. s.* }
EXEGE'TICAL, *adj.* } Fr. *exégèse*; Gr. εξηγησις. An explanation; explanatory.
EXEGE'TICALLY, *adv.* }

I have here and there interspersed some critical and some *exegetical* notes, fit for learners to know, and not unfit for some teachers to read. *Walker.*

Exegesis, in the Scotch universities, is an exercise among the students in divinity, in which a question is stated by the respondent, who is then opposed by other students in their turns, during which the professor solves the difficulties which the respondent cannot overcome.

EXEGETES; from εξηγεομαι, to explain; among the Athenians, persons learned in the laws, whom the judges used to consult in capital causes.

EXEGETICA, in algebra, the art of finding, either in numbers or lines, the roots of the equation of a problem, according as the problem is either numerical or geometrical.

EXEMPLAR. See Example.

Exemplar also denotes the image conceived in the mind of the artist, whereby he conducts his work.

**EXEMPLIFY.** See EXAMPLE.

**EXEMPLIFICATION** OF LETTERS PATENT, denotes a copy made from the enrolment, and sealed with the great seal; which is as effectual as the original.

EXEMPT', *v. a.* & *adj.*
EXEMP'TION, *n. s.*
EXEMPTI'TIOUS, *adj.*
Fr. *exempter*; Span. *exemtar*; Lat. *exemptus*, ab *eximor*, *eximo*, to take out, or away. To deliver, or grant immunity, from; to free, or clear: as an adjective, not liable to; not included; cut off from: exemptitious is separable; that which may be divided, or taken from another matter or thing.

Things done well,
And with a care, *exempt* themselves from fear:
Things done without example, in their issue
Are to be feared. *Shakspeare.*

Was not thy father for treason headed?
And by his treason stand'st not thou attainted,
Corrupted, and *exempt*, from ancient gentry? *Id.*

The religious were not *exempted*, but fought among the other soldiers. *Knolles's History of the Turks.*

The like *exemption* hath the writ to enquire of a man's death, which also must be granted freely. *Bacon.*

Do not once hope, that thou canst tempt
A spirit so resolved to tread
Upon thy throat, and live *exempt*
From all the nets that thou canst spread. *Ben Jonson.*

If the motion were loose or *exemptitious* from matter, I could be convinced that it had extension of its own. *More.*

His dreadful imprecation hear;
'Tis laid on all, not any one *exempt*. *Lee's Oedipus.*

No man, not even the most powerful among the sons of men, is *exempt* from the chances of human life. *Atterbury.*

The emperors *exempted* them from all taxes, to which they subjected merchants without exception. *Arbuthnot on Coins.*

The Roman laws gave particular *exemptions* to such as built ships or traded in corn. *Arbuthnot.*

An abbot cannot, without the consent of his convent, subject a monastery to any, from whose jurisdiction such monastery was *exempted*. *Ayliffe.*

The god constrains the Greek to roam,
A hopeless exile from his native home,
From death alone *exempt*. *Pope's Odyssey.*

There seem to be two situations which may be conceived to be *exempted* from rain falling upon 'em, one where the constant trade-winds meet beneath the line, for here two regions of warm air are mixed together, and thence do not seem to have any cause to precipitate their vapor; and the other is, where the winds are brought from colder climates, and become warmer by their contact with the earth of a warmer one. *Darwin.*

You, in your grotto work enclosed,
Complain of being thus exposed;
Yet nothing feel in that rough coat,
Save when the knife is at your throat,
Wherever driven by wind or tide,
*Exempt* from every ill beside. *Cowper.*

EXEMPTIONS, in law. Peers are exempted from being sworn upon inquests, and knights, clergymen, and others, from appearing at the sheriff's turn. Persons of seventy years of age, surgeons, apothecaries, &c., are exempted from serving on juries; and justices of the peace, attorneys, &c. from parish offices.

EXEN'TERATE, *v. a.*
EXENTERA'TION *n. s.*
Lat. *exentero*. To embowel; to deprive of the entrails. The act of taking out the bowels.

A toad contains not those urinary parts which are found in other animals to avoid that serous excretion, which may appear unto any that *exenterates* or dissects them. *Browne.*

Belonius not only affirms that chamelions feed on flies, caterpillars, beetles, and other insects, but upon *exenteration* he found these animals in their bellies. *Id.*

EXE'QUIES, *n. s., plur.*
EXE'QUIAL, *adj.*
Lat. *exequiæ*. Funeral rites; the ceremony, or procession, of burial: relating to a funeral.

Let's not forget
The noble duke of Bedford, late deceased,
But see his *exequies* fulfilled in Roan. *Shakspeare.*

Whatever eye shalt finde this hatfull scrole
After the date of my deare *exequies*,
Ah! pitty thou my playning orphane's dole,
That faine would see the sunne before it dyes.
*Bp. Hall. Charge to his Satires.*

The tragical end of the two brothers, whose *exequies* the next successor had leisure to perform. *Dryden.*

EX'ERCISE, *v. a.*, *v. n.* & *n. s.*
EX'ERCENT, *adj.*
EX'ERCISER, *n. s.*
EXERCITA'TION.
Fr. *exercice*; Ital. *essercitio*, *essercitatione*; Span. and Port. *exercicio*; Lat. *exercitium*, *exerceo*, to use energetically. To employ; engage; train to practice: hence to make skilful; to busy: as a neuter verb to use labor: as a substantive, exercise is labor; employment; labor with a view to health, or as contrasted with labor undertaken from necessity; practise; task; an act of divine worship: exercitation is a synonyme of exercise.

Sore travel hath God given to the sons of man to be *exercised* therewith. *Eccl.* i. 13.

The princes of the Gentiles *exercise* dominion over them, and they that are great *exercise* authority upon them. *Matt.* xx.

Strong meat belongeth to them who, by reason of use, have their senses *exercised* to discern both good and evil. *Hebr.*

Youth will never live to age, without they keep themselves in breath with *exercise*, and in heart with joyfulness. *Sir P. Sidney.*

Until men find pleasure in the *exercise* of the mind, great promises of much knowledge will little persuade them that know not the fruits of knowledge. *Id.*

The sceptre of spiritual regimen over us in this present world, is at the length to be yielded up into the hands of the Father which gave it; that is, the use and *exercise* thereof shall cease, there being no longer on earth any militant church to govern. *Hooker.*

Good sir John,
I'm in your debt for your last *exercise*;
Come the next Sabbath, and I will content you. *Shakspeare.*

A man's body is confined to a place; where friendship is, all offices are granted to him and his deputy: for he may *exercise* them by his friend. *Bacon's Essays.*

Men ought to beware that they use not *exercise* and a spare diet both: but if much *exercise*, a plentiful diet; if sparing diet, little *exercise*. *Bacon.*

As a watchful king, he would not neglect his safety, thinking nevertheless to perform all things rather as an *exercise* than as a labour. *Id.*

Where pain of unextinguishable fire
Must *exercise* us without hope of end. *Milton.*

Patience is more oft the *exercise*
Of saints, the trial of their fortitude
Making them each his own deliverer,
And victor over all
That tyranny or fortune can inflict. *Id.*

It were some extenuation of the curse, if in sudore vultus tui were confinable unto corporeal *exercitations.* *Browne.*

He was strong of body, and so much the stronger as he, by a well-disciplined *exercise*, taught it both to do and to suffer. *Sidney.*

Age's chief arts, and arms, are to grow wise;
Virtue to know, and, known, to *exercise.* *Denham.*

The wise for cure on *exercise* depend:
God never made his work for man to mend. *Dryden.*

And now the goddess, *exercised* in ill,
Who watched an hour to work her impious will,
Ascends the roof. *Dryden's Æneid.*

To you such scabbed harsh fruit is given, as raw
Young soldiers at their *exercisings* gnaw. *Dryden.*

Their consciences oblige them to submit to that dominion which their governours had a right to *exercise* over them. *Locke.*

The learning of the situation and boundaries of kingdoms, being only an *exercise* of the eyes and memory, a child with pleasure will learn them. *Id.*

This faculty of the mind, when it is *exercised* immediately about things, is called judgment. *Id.*

By frequent *exercitutions* we form them within us. *Felton.*

Mean while I'll draw up my Numidian troop
Within the square, to *exercise* their arms. *Addison.*

The French apply themselves more universally to their *exercises* than any nation: one seldom sees a young gentleman that does not fence, dance, and ride. *Id.*

Lewis refused even those of the church of England, who followed their master to St. Germain's, the public *exercise* of their religion. *Id.*

The Lacedemonians were remarkable for the sport, and Alexander the Great frequently *exercised* at it. *Broome.*

He will *exercise* himself with pleasure, and without weariness, in that godlike employment of doing good. *Atterbury.*

He is exact in prescribing the *exercises* of his patients, ordering some of them to walk eighty stadia in a day, which is about nine English miles. *Arbuthnot on Coins.*

The purest *exercise* of health,
The kind refresher of the Summer heats. *Thomson.*

Know then, that providence calls thee to the *exercise* of industry, contentment, submission, patience, hope, and humble dependence on him, and a respectful deference to thy superiors. *Mason.*

Prepare yourselves for the great world, as the athletæ used to do for their *exercises.* *Chesterfield.*

If after *exercise* we feed sparingly, the digestion will be easy and good, the body lightsome, the temper cheerful, and all the animal functions performed agreeably. *Franklin.*

Good lack! quoth he, yet bring it me,
My leathern belt likewise,
In which I bear my trusty sword,
When I do *exercise.* *Cowper.*

When we go from home in quest of amusement, or to the fields for the sake of *exercise*, we shall do well to leave all our speculations behind: if we carry them with us, the *exercise* will fatigue the body without refreshing it; and the amusement, instead of enlivening, will distract the soul. *Beattie.*

But pray, Mr. Puff, what first put you on *exercising* your talents in this way? *Sheridan.*

A division which is very ancient, but, though sanctioned by the approbation of many ages, very illogical; since the will, which, in this division, is nominally opposed to the intellect, is so far from being opposed to it in reality, that, even by the assertors of its diversity, it is considered as *exercising*, in the intellectual department, an empire almost as wide as in the department allotted to itself. *Dr. T. Brown.*

Exercise, or bodily motion, constitutes, in the language of the older physicians, one of the six non-naturals, and has been justly considered, from the earliest times, as an important measure in the preservation of health, as well as in the cure of several diseases. It increases the circulation of the blood, attenuates the fluids; promotes a regular perspiration, and a due secretion of all the humors; accelerates the animal spirits; facilitates their distribution into all the fibres of the body; strengthens the parts; creates an appetite, and helps digestion. Boerhaave recommends bodily exercise in diseases of a weak and lax fibre. By riding on horseback, says his commentator, the pendulous viscera of the abdomen are shaken every moment, and gently rubbed one against another, while in the mean time the pure air acts on the lungs with greater force. ' But, though nothing is more conducive to health than moderate exercise, yet violent exercise dissipates the spirits, weakens the body, destroys the elasticity of the fibres, and exhausts the fluid parts of the blood.

Exercise, or Manual Exercise, in military affairs, is the ranging a body of soldiers in form of battle, and making them perform the several motions and military evolutions with different management of their arms, in order to make them expert therein. See Gymnastics and Medicine.

Formerly, in the British service, every commander in chief, or officer commanding a corps adopted or invented such manœuvres as he judged proper, excepting in the instance of a few regulations for review: neither the manual exercise, nor quick and slow marching were precisely defined by authority.—Consequently, when regiments from different parts of the kingdom were brigaded, they were unable to act in line till the general officer commanding had established some temporary system to be observed by all under his command.

These inconveniences were, in some degree, obviated by the Rules and Regulations compiled by general Dundas, on the system of the Prussian discipline, as established by Frederick the Great.

When a regiment is drawn up or paraded for exercise, the men are placed three deep, either by companies, or divided into platoons, with the grenadiers on the right. When soldiers are drawn up for exercise, the ranks and files should be exactly even. The distances between the files must be equal, and the ranks eight feet distant from each other. Every motion should

be performed with life, and the greatest exactness observed in all firings, wheelings, and marchings; and therefore a regiment should never be under arms longer than two hours. The following is an abstract of the manual exercise, as altered and abridged by his Majesty's command, 1792.—*Position of the Soldier under Arms.* The equal squareness of the shoulders and body to the front, is the first and great principle of the position of the soldier:—The heels must be in a line, and closed:—The knees straight without stiffness;—The toes turned out, so that the feet may form an angle of about sixty degrees; the arms hang near the body, but not stiff; the flat of the hand, and little finger, touching the thigh, and the thumbs as far back as the seams of the breeches?—The elbows and shoulders are to be kept back:—The belly rather drawn in; and the breast advanced, but without constraint;—The body to be upright, but inclining rather forwards, so that the weight of it may bear chiefly on the fore part of the feet;—The head to be erect; and neither turned to the right nor to the left; the eyes alone will be glanced to the right. The body of the soldier being in this position, the firelock is to be placed in his left hand, against the shoulder; his wrist to be a little turned out, the thumb alone to appear in front; the four fingers to be under the butt; and the left elbow to be rather bent inwards, so as not to be separated from the body, or to be more backward or forward than the right one:—The firelock must rest on the hand, not on the end of the fingers; and be carried in such a manner as not to raise, advance, or keep back one shoulder more than the other; the butt must therefore be forward, and as low as can be permitted without constraint; the fore part a very little before the front of the thigh; and the hind part of it pressed by the wrist against the thigh:—It must be kept steady and firm before the hollow of the shoulder; should it be drawn back or carried too high, the one shoulder would be advanced, the other kept back, and the upper part of the body would be distorted, and not square with respect to the limbs.—Words of Command. I. *Order Arms.* Bring the firelock to the trail in two motions, as usual, seizing it at the first, at the lower loop, just above the swell; at the second, bring it down to the right side, the butt within two inches of the ground; at the third, drop the butt on the ground, placing the muzzle against the hollow of the right shoulder, and the hand flat upon the sling. II. *Fix Bayonets.* At the word *Fix*, place the thumb of the right hand, as quick as possible, behind the barrel, taking a gripe of the firelock; as soon as the word of command is fully out, push the firelock a little forward, at the same time drawing out the bayonet with the left hand, and fixing it with the utmost celerity. the instant this is done, return, as quick as possible, to the order, as above described, and stand perfectly steady. III. *Shoulder Arms.* As soon as the word shoulder is given, take a gripe of the firelock with the right hand, as in fixing bayonets, and, at the last word *arms*, the firelock must be thrown with the right hand in one motion, and with as little appearance of effort as possible, into its proper position on the left shoulder;—the hand is brought to the centre of the body in so doing, but must instantly be withdrawn. IV. *Present Arms.* First, Seize the firelock with the right hand, under the guard, turning the lock to the front, but without moving it from the shoulder; second, bring it to the poise, seizing it with the left hand, the fingers extended along the sling, the wrist upon the guard, and the point of the left thumb of equal height with the eyes; third, Bring down the firelock with a quick motion, as low as the right hand will admit without constraint, drawing back the right foot at the same instant, so that the hollow of it may touch the left heel.—The firelock in this position is to be totally supported in the left hand;—the body to rest entirely on the left foot; both knees to be straight. V. *Shoulder Arms.* First, By a turn of the right wrist, bring the firelock to its proper position on the shoulder, as described above, the left hand grasping the butt:—second, Quit the right hand, bring it briskly down to its place by the side. VI. *Charge Bayonets.* At one motion throw the firelock from the shoulder across the body to a low diagonal recover. VII. *Port Arms.* First, Turn the lock to the front, and at the height of the breast; the muzzle slanting upwards so that the barrel may cross opposite the point of the left shoulder, with the butt proportionally depressed: the right hand grasps the small of the butt, and the left holds the piece at the swell, close to the lower pipe, the thumbs of both hands pointing towards the muzzle; second, make a half-face to the right, and bring down the firelock to nearly a horizontal position, with the muzzle inclining an inch upwards, and the right wrist resting against the hollow of the thigh, just below the hip.—N. B. The first motion of the charge is the position which the soldier will, either from the shoulder, or after firing, take, in order to advance on an enemy, whom it is intended to attack with fixed bayonets; and the word of command for that purpose is, prepare to charge. Second, The position of the charge is that which the front rank takes, when arrived at a few yards distance only from the body to be attacked. The first motion of the charge is also that which sentries are to take, when challenging any persons who approach their posts. VIII. *Shoulder Arms.* First, Face to the front, and throw up the piece into its position on the shoulder, by a turn of the right wrist, instantly grasping the butt, as above described, with the left hand; but particular care must be taken, that the shoulder does not fall to the rear. Second, Quit the firelock briskly with the right hand, bringing it to its proper place by the side. The men must be taught likewise to support arms at three motions, throwing the first and second nearly into one: at the first motion, they seize the small of the butt under the lock with the right hand, bringing the butt in front of the groin, and keeping the lock somewhat turned out; at the second they bring the left arm under the cock: at the third they quit the right hand. In carrying arms from the support, the motions are exactly reversed.

Cavalry Exercise is of two sorts, on horseback, and on foot. The squadrons for exercise are sometimes drawn up three deep, though fre-

quently two deep; the tallest men and horses in the front, and so on. When a regiment is formed in squadrons, the distance of twenty-four feet, as a common interval, is always to be left between the ranks; and the files must keep boot-top to boot-top. The officers commanding squadrons must, above all things, be careful to form with great celerity, and, during the whole time of exercise, to preserve their several distances. In all wheelings, the flank which wheels must come about in full gallop. The men must keep a steady seat upon their horses, and have their stirrups at a fit length.

Artillery Exercise is the method of teaching the regiments of artillery the use and practice of all the various machines of war, viz. Exercise of the light field pieces teaches the men to load, ram, and sponge the guns well; to elevate them according to the distance, by the quadrant and screw; to judge of distances and elevations without the quadrant; how to use the port-fire, match, and tubes for quick firing; how to fix the drag-ropes, and use them in advancing, retreating, and wheeling with the field-pieces; how to fix and unfix the trail of the carriage on the limbers; and how to fix and unfix the boxes containing the ammunition upon the limbers of the carriages. Exercise of the garrison and battering artillery is to teach the men how to load, ram, and sponge; how to handle the hand-spikes in elevating and depressing the metal to given distances; and for ricochet, how to adjust the coins, and work the gun to its proper place; and how to point and fire with exactness, &c.

Exercise, in the royal navy, is the preparatory practice of managing the artillery and small arms, in order to make the ship's crew perfectly skilled therein, so as to direct its execution successfully in the time of battle.

The words of command introduced, during the late war, for the exercise of the great guns, are the following: Silence; cast loose your guns; level your guns; take out your tompions; run out your guns; prime; point your guns; fire; sponge your guns; load with cartridge; shot your guns; put in your tompions; house your guns; and secure your guns.

EXERT', *v. a.* } Lat. *exero*, *ex*, expletive, and
Exer'tion, *n. s.* } *sero*, to plant, or sow. To apply with effort or energy; to use with ardor; to put or push forth; enforce.

Strong virtue, like strong nature, struggles stil,
*Exerts* itself, and then throws off the ill. *Dryden.*

The stars, no longer overlaid with weight,
*Exert* their heads from underneath the mass,
And upward shoot and kindle as they pass,
And with diffusive light adorn the heavenly place. *Id.*

The several parts lay hidden in the piece,
Tho' occasion but *exerted* that or this. *Id.*

When the will has *exerted* an act of command upon any faculty of the soul, or member of the body, it has done all that the whole man, as a moral agent, can do for the actual exercise or employment of such a faculty or member. *South.*

The orchard loves to wave
With Winter winds, before the gems *exert*
Their feeble heads. *Philips.*

There is nothing *exerts* a genius so much as writing plays; the reason is, that the writer puts himself in the place of every person that speaks. *Shenstone.*

When so much general productive *exertion* is the consequence of luxury, the nation does not care though there are debtors in gaol; nay, they would not care though their creditors were there too. *Johnson.*

On subjects on which the mind has been much informed, invention is slow of *exerting* itself. *Sheridan.*

EXE'SION, *n. s.* Lat. *exesus*. The act of eating through.

Theophrastus denieth the *exesion* or forcing of vipers through the belly of the dam. *Browne.*

EXESTUA'TION, *n. s.* Lat. *exæstuo*. The state of boiling; tumultuous heat; effervescence.

Saltpetre is in operation a cold body: physicians and chymists give it in fevers, to allay the inward *exestuations* of the blood and humours. *Boyle.*

EXETER, q. d. Execester, i. e. a city upon the Ex. The capital of Devonshire, anciently called Isex, and Isia Dumnoniorum. It had six gates, besides many turrets, several of which are now destroyed. It had formerly so many convents, that it was called Monktown, till king Athelstan changed its name to Exeter, about A. D. 930; when he fortified it with circular walls, embattlements, towers, and turrets of stone, encircling the whole, except the west side, with a deep moat. St. Peter's cathedral is a magnificent pile; though little now remains of the ancient fabric, except that part called Our Lady's Chapel. It has a ring of twelve bells, reckoned the largest in England: as is also its organ, whose largest pipes are fifteen inches in diameter. In 1763 the cathedral was repaired and new paved; when, in removing the old pavement, was found the leaden coffin and skeleton of bishop Bitten, who died in 1307; near the bones of the finger was found a sapphire ring. Near this stood a small neat chalice and patten of silver gilt. The top of the crozier was also found, but totally decayed. A most beautiful modern painted glass window has been lately erected at the west end of the cathedral, the east end having before a remarkably fine antique one. In the other windows there is much fine ancient painted glass. The altar is remarkable for its beautiful design and execution. On the left hand side of it is the seat where Edward the Confessor and his queen sat and installed Leofric his chancellor, the first bishop of Exeter; and in the south cross aisle is the monument of the same Leofric who died in 1073. The western end of the church is adorned with the statues of the patriarchs, &c. The Chapter-house was built in 1439. The throne for the bishop was construc'ted about 1466, and is said to be the grandest of the kind in Britain. The great north tower was completed in 1485, and contains a bell that weighs 17,472 pounds. This city has had various royal charters; but it was made a corporate town in the reign of king John, and a county by Henry VIII. It is governed by a mayor, twenty-four aldermen, four bailiffs, a recorder, chamberlain, sheriff, town clerk, &c., who try all civil causes. Criminal causes are tried by eight aldermen, who are justices of the peace. It had anciently a mint; and in the reigns of William III. and queen Anne, many pieces of silver money were coined

in it, which have an E under the bust. It has twelve or thirteen incorporated companies, and sends two members to parliament. Exeter has four principal streets, centering in the middle, which is therefore called Carfox, from the old Norman, Quatre voyes, i. e. the four ways. There is an old castle in the north-east part of the city, called Rougemont, from the red soil it stands on, supposed to have been built by the West-Saxon kings. This castle was remarkably strong both by nature and art. The original gate was walled up by William I.; and close by it an inferior one was made in the wall, in which state they both remain. The outward stone facing is kept in tolerable repair. The ancient chapel, built in 1260, is also kept in good repair. The city is healthy, and pleasantly situated on a hill, having other hills on the north-east and south, which shelter it from storms. The bank, which sustained the ditch that nearly surrounded the castle, is planted, gravelled, and accommodated with seats, being the place of resort for walking; and the ditch, being filled up and planted with elms, forms a delightful grove. The old palace is demolished, and an elegant session-house is erected, where the assizes, quarter sessions, and county courts, are held. In the city and suburbs are prisons, a workhouse, alms-houses, and charity-schools; an hospital for the sick and lame, and two free grammar schools. It has markets on Wednesdays and Fridays; and four fairs. Great trade is carried on here for serges, long ells, and other woollen goods; yet no markets were erected here for wool yarn, and kerseys, till the 30th of Henry VIII. Before that time, the merchants carried on a considerable trade to Spain and France; and were incorporated in the reign of Mary I. Here is also a weekly serge market, the second in England: in some weeks as many serges have been sold here as amounted to £80,000 or £100,000. Great quantities of woollen goods are also exported to Portugal, Spain, Italy, Germany, &c. The city was anciently possessed by the Romans, whose coins have been frequently dug up in it. The Saxons drove the Britons out of it into Cornwall, and encompassed it with a ditch and bulwarks. The Danes plundered it in 875, and afterwards, in revenge of the general massacre of the Danes by the English, Sueno, one of their kings, came hither with great force, put the men to the sword, ravished the women, massacred the children, burnt the city, and defaced the walls. Just as it was reviving, William the Conqueror besieged and took it; and it was again besieged in the reigns of Stephen and Edward IV. In that of Henry VII. it was besieged by Perkin Warbeck; but the citizens forced him to raise the siege; which so pleased the king, that he came hither and presented a cap of maintenance to the city, and gave the sword from his side to be borne always before the mayor. In the reign of Edward VI., in July 1544, it was smartly cannonaded by the rebels of Cornwall and Devon, who almost starved it by breaking down its bridges, cutting off its water, and stopping up all passages; but it held out till lord Russel raised the siege on the 6th of August, which was appointed as an anniversary day of thanksgiving, and is still observed. King Charles I's queen, to whom this city gave shelter in the civil wars, was here delivered of Henrietta, afterwards duchess of Orleans; whose picture is in its guildhall, as are also those of general Monk and George I., &c. An elegant circus is built on the spot, with a theatre adjoining it: and for the conveniency of the inhabitants, a passage has been made through the town-wall to Southern Hay, on which green stands the county hospital, besides a considerable number of new buildings. There are remains of an old palace of king Athelstan. The guildhall is a spacious and convenient building, first erected in 1330, to which its present front was rebuilt in 1593, and repaired in 1720. An arm of the sea formerly flowed nearly up to the city's wall, till 1316, when Hugh Courtenay earl of Devon, in revenge for an affront, ruined the navigation, by constructing wears and dams in the river; but to remedy it, in 1539, an act of parliament passed for making a navigable canal, for the better conveyance of goods in barges to Topsham. This was carried into execution in 1581, but not completed till 1675; nor was it after all found sufficient, till the present haven was constructed in 1697, when it was rendered capable of bringing ships of 150 tons quite to the quay, near the city. It is thirty-one miles N. N. E. of Dartmouth, seventy-eight south-west of Bristol, eighty-eight of Salisbury, 173 west by south of London, and ten north-west of the British Channel.

Exeter, a bishopric of England, comprehending the counties of Cornwall and Devonshire. The bishop's seat was transferred to Exeter, from Crediton, by Edward the Confessor. The see was once one of the most wealthy in the kingdom; but its revenues were shamefully wasted by bishop Voysey, who alienated its lands. What he left was so much incumbered, that the see has never recovered its former grandeur; and so small are its present revenues, that it has been found necessary for the bishop to hold some other preferment to support his dignity. The diocese contains 604 parishes, of which 239 are impropriate. It has four archdeacons, viz. of Cornwall, Exeter, Barnstaple, and Totness. It was formerly valued in the king's books at £1556 14*s.* 6*d.*; but, since bishop Voysey's time, more than two-thirds of its value are computed to have been alienated. The clergy's tenth was not long since about £1200. To the cathedral belong, besides the bishop, a dean, four archdeacons, a chancellor, a treasurer, a chantor, and twenty-four prebendaries.

EXFO'LIATE, *v. n.*
Exfo'liation, *n. s.*
Exfo'liative, *adj.*
Fr. *exfolier*; Lat. *ex* and *folium*, a leaf. To shell, or cast off; a term applied in surgery to the separation of the corrupt from the sound part of a bone.

Our work went on successfully, the bone *exfoliating* from the edges. *Wiseman's Surgery.*

Dress the bone with the milder *exfoliatives*, 'till the burnt bone is cast off. *Id.*

Exfoliation, in surgery, denotes the process by which the dead portion of a bone separates from the living part. This operation of nature very much resembles the sloughing away of the softer parts. A dead bone, says Mr. Hunter, acts

on the system in the same manner as any other extraneous body. It stimulates the adjacent living parts, in consequence of which the living adjacent bone becomes more vascular, a circumstance which always takes place when a part has more to do than is just sufficient for the support of life; and the earth of the living part, when it is in contact with the dead bone, is absorbed. Hence the bone becomes softer, and is now only adherent by the animal matter in its texture. In proportion to the waste made by the last part of the process, a fungus arises from the living surface, and fills up the intermediate space, so as to prevent a vacuum; and, when a portion of the bone is once loose, it will be pushed towards the surface of the body, as most other inanimate substances are. This part of the process is partly mechanical, and partly a continuation of ulceration. In the bones of persons who die while exfoliation is going on, a small groove, or worm-eaten canal may be discovered, which follows the irregularities of the dead and living surfaces. Thus we find that exfoliation, and the process by which a slough of the soft parts is detached, are nearly alike. In both instances, the matter which forms the bond of connexion between the dead and living substances, is absorbed, the dead part is looosened, and is next pushed off by the rising of the granulations. See SURGERY.

EXHALE', *v. a.* } Fr. *exhaler*; Lat. *exhalo*; EXHALE'MENT, *n. s.* } to send out breath. To EXHALA'TION. } breathe outwards; to send or draw out vapors, fumes, or fluids: exhalement is the matter exhaled.

Yon light is not daylight, I know it well:
It is some meteor that the sun *exhales*,
To be to thee this night a torch-bearer.
*Shakspeare.*

See, dead Henry's wounds
Open their congealed mouths, and bleed afresh!
Blush, blush, thou lump of foul deformity;
For 'tis thy presence that *exhales* this blood
From cold and empty veins, where no blood dwells!
*Id.*

No nat'ral *exhalation* in the sky,
No 'scape of nature, no distemper'd day,
But they would pluck away its nat'ral cause,
And call them meteors, prodigies, and signs. *Id.*

Moving in so high a sphere, and with so vigorous a lustre, he must needs, as the sun, raise many envious *exhalations*; which, condensed by a popular odium, are capable to cast a cloud upon the brightest merit and integrity. *King Charles.*

As frozen dung-hills in a winter's morne,
That voyd of vapours seemed all beforne,
Soone as the sun sends out his piercing beames,
*Exhale* out filthie smoke and stinking steames.
*Bp. Hall.*

A fabrick huge
Rose like an *exhalation*, with the sound
Of dulcet symphonies and voices sweet. *Milton.*

Aqua-fortis, or any mineral solution, either of vitriol, alum, salt-petre, ammoniac, or tartar, which, although to some degree *exhaled* and placed in cold conservatories, will chrystallize and shoot into white and glacious bodies.
*Sir Thomas Browne*, book ii. ch. i.

Nor will polished amber, although it send forth a gross and corporeal *exhalement*, be found a long time defective upon the exactest scales. *Browne.*

The fire may resolve some of the more spirituous and *exhalable* parts, whereof distillation has shewn me that alabaster is not destitute, into vapours.
*Boyle.*

I flattered myself with the hopes that the vapour had been *exhaled*. *Temple.*

Fear freezes minds; but love, like heat,
*Exhales* the soul sublime to seek her native seat.
*Dryden.*

It is no wonder if the earth be often shaken, there being quantities of *exhalations* within those mines, or cavernous passages, that are capable of rarefaction and inflammation. *Burns.*

The growing towers like *exhalations* rise
And the huge columns heave into the skies.
*Pope*

Praise, the sweet *exhalation* of our joy,
That joy exalts, and makes it sweeter still.
*Young*

'Tis true, that if to trifle life away
Down to the sunset of their latest day,
Then perish on futurity's wide shore
Like fleeting *exhalations*, found no more.
*Cowper.*

EXHALATION and EVAPORATION are often used synonymously, but accurate writers distinguish them, appropriating the latter to the raising of moist fumes from liquid bodies, and the former to the emission of dry effluvia from solid bodies, as earth, fire, minerals, &c. In this sense, exhalations are dry and subtle corpuscles, loosened from hard terrestrial bodies, either by the heat of the sun, the action of the air, or some other cause; and emitted upwards to a certain height in the atmosphere, where, mixing with the vapors, they help to form clouds, and return back in rain, mist, &c.

EXHAUST', *v. a.* } Lat. *exhaurire*, *ex-* EXHAUST'IBLE, *adj.* } *haustus* (*ex* and *haurio*, EXHAUST'ION, *n. s.* } Gr. ἀρυω, to draw out). EXHAUST'LESS, *adj.* } To drain; draw out entirely; diminish or deprive by draining; to weaken: exhaustless is, not to be exhausted.

Single men be many times more charitable, because their means are less *exhausted*. *Bacon.*

Though the knowledge they have left us be worth our study, yet they *exhausted* not all its treasures: they left a great deal for the industry and sagacity of after-ages. *Locke.*

Of heat and light, what everduring stores
Brought from the sun's *exhaustless* golden shores,
Through gulphs immense of intervening air,
Enrich the earth and every loss repair. *Blackmore.*

Spermatick matter of a vitious sort abounds in the blood, *exhausts* it of its best spirits, and derives the flower of it to the seminal vessels. *Wiseman.*

Story-telling is subject to two unavoidable defects; frequent repetition, and being too soon *exhausted*.
*Swift.*

The careful insect midst his works I view,
Now from the flowers *exhaust* the fragrant dew.
*Gay.*

The arts and sciences, like some plants, require a fresh soil; and however rich the land may be, and however you may recruit it by art and care, it will never, when once *exhausted*, produce any thing that is perfect or finished in the kind. *Hume.*

Perceiving, at length, that his strength began to be *exhausted*, we took him into the boat, and conveyed him home in the evening completely drenched.
*Franklin.*

Curiosity, from its nature, is a very active principle; it quickly runs over the greatest part of its objects, and soon *exhausts* the variety which is common to be met with in nature. *Burke.*

But sin marred all; and the revolt of man,
That source of evils not *exhausted* yet,
Was punished with revolt of his from him.
*Cowper.*

Whence the use of much wine, or opium, or spice, or of much salt, by their unnatural stimulus induces consequent debility, and shortens life, on the one hand, by the *exhaustion* of sensorial power; so on the other hand, the want of heat, food, and fresh air, induces debility from defect of stimulus, and a consequent accumulation of sensorial power, and a general debility of the system. *Darwin.*

What then avails, that with *exhaustless* store,
Obsequious Luxury loads thy glittering shrine?
What then avails, that prostrate slaves adore,
And Fame proclaims thee matchless and divine?
*Beattie.*

Thus uncontrolled, in mutual bliss,
And rich in love's *exhaustless* mine,
Do thou snatch treasures from my lips,
And I'll take kingdoms back from thine!
*Sheridan.*

Exhaustions, in mathematics. The method of exhaustions, is a way of proving the equality of two magnitudes, by a reductio ad absurdum; showing, that if one be supposed either greater or less than the other, there will arise a contradiction. It is founded upon the exhausting a quantity by continually take away certain parts of it. This method was of frequent use among the ancient mathematicians; as Euclid, Archimedes, &c. It is founded on the tenth book of Euclid, where he argues that those quantities whose difference is less than any assignable quantity, are equal; for if they were unequal, be the difference ever so small, yet it may be so multiplied, as to become greater than either of them, if not so, then it is really nothing. This he assumes in the proof of proposition I. book x. which imports, that if, from the greater of two quantities, be taken more than its half, and from the remainder more than its half, and so continually, there will, at length, remain a quantity less than either of those proposed. On this foundation it is demonstrated, that if a regular polygon of infinite sides be inscribed in, or circumscribed about, a circle; the space, which is the difference between the circle and the polygon, will, by degrees, be quite exhausted, and the circle become equal to the polygon.

EXHEREDATION, in the civil law, with us ordinarily called disinheriting, is the father's excluding his son from inheriting his estate. There are fourteen causes of exheredation expressed in Justinian's Novellæ; without some of which, he decrees the exheredation null, and the testament inofficious, as the civilians call it. Indeed, by the ancient Roman law, the father might pronounce exheredation without any cause: but the rigor of this law was restrained and moderated by Justinian.

EXHIB'IT, *v. a.*
Exhib'iter, *n. s.*
Exhibi'tion, *n. s.*
Exhib'itive, *adj.*
Fr. and Span. *exhiber*; Ital. *essibere*; Lat. *exhibere*, from *ex*, forth, and *habeo*, to have; to have openly. To offer to open view; to propose or expose publicly; to display: exhibitive is representation; displaying.

If any claim redress of injustice, they should *exhibit* their petitions in the street. *Shakspeare.*

He seems indifferent,
Or rather swaying more upon our part,
Than cherishing the *exhibiters* against us. *Id.*
I crave fit disposition for my wife,
Due preference of place and *exhibition*,
As levels with her breeding. *Id.*

I would not do such a thing for gowns, petticoats, nor caps, nor any petty *exhibition*. *Id.*

All was assigned to the army and garrisons there, and she received only a pension or *exhibition* out of his coffers. *Bacon.*

He suffered his attorney-general to *exhibit* a charge of high treason against the earl. *Clarendon.*

Merely by blowing fine crystal-glass, at the flame of a lamp, to a very extraordinary thinness, we have made it to *exhibit*, and that vividly, all the colours (as they speak) of the rainbow.
*Boyle. Experiments. Notes, &c.*

What are all mechanick works, but the sensible *exhibition* of mathematick demonstrations. *Grew.*

Truths must have an eternal existence in some understanding; or rather, they are the same with that understanding itself, considered as variously *exhibitive* or representative, according to various modes of imitability or participation. *Norris.*

One of an unfortunate constitution is perpetually *exhibiting* a miserable example of the weakness of mind and body. *Pope.*

He is now neglected, and driven to live in exile upon a small *exhibition*. *Swift.*

Mr. Denham took a warehouse in Water-street, where we *exhibited* our commodities. I applied myself closely, studied accounts, and became in a short time very expert in trade. *Franklin.*

Ocean *exhibits*, fathomless and broad,
Much of the power and majesty of God.
He swathes about the swelling of the deep,
That shines and rests, as infants smile and sleep.
*Cowper.*

Exhibit, in law, is where a deed, or other writing, being produced in a chancery suit to be proved by witnesses, the commissioner, appointed for the examination, certifies on the back of the writing, that it was shown to the witness at his examination, and by him sworn to.

Exhibition, in law, a production of titles, and other proofs of a matter in contest.

EXHIL'ARATE, *v. a.*
Exhilara'tion, *n. s.*
Fr. *exhilarer*; Ital. *essilarare*; Lat. *exhilarare*, i. e. *ex*, expletive, and *hilaro* ab *hilaris*; Gr. ἱλαρος, from ἑλη, splendor. To cheer; make cheerful; enliven.

*Exhilaration* hath some affinity with joy, though it be a much lighter motion. *Bacon.*

The coming into a fair garden, the coming into a fair room richly furnished, a beautiful person, and the like, do delight and *exhilarate* the spirits much.
*Id. Natural History.*

The force of that fallacious fruit,
That with *exhilarating* vapours bland
About their spirits had played, and inmost powers
Made err, was now exhaled. *Milton.*

Let them thank
Boon nature, that thus annually supplies
Their vaults, and with her former liquid gifts
*Exhilarates* their languid minds, within
The golden mean confined. *Philips.*

The same sun which gilds all nature, and *exhilarates* the whole creation, does not shine upon disappointed ambition. *Burke.*

EXHO'RT, *v. a.* | Fr. *exhorter;* Span.
EXHORTA'TION, *n. s.* | *esortar;* Ital. *essortare;*
EXHORT'ATIVE, *adj.* | Lat. *exhortari,* i. e. *ex,*
EXHORT'ATORY, | expletive, and *hortor,* to
EXHORT'ER, *n. s.* | enjoin, from Gr. ὄρω,
perf. pass. ὦρται, to excite. To urge by words to the performance of duty: exhortative is containing exhortation; exhortatory, tending to exhort.

We beseech you, and *exhort* you by the Lord Jesus, that as you have received of us, how you ought to walk, so ye would abound. *Thessalonians.*

My duty is to *exhort* you to consider the dignity of that holy mystery. *Common Prayer.*

'll end my *exhortation* after dinner. *Shakspeare.*

Designing or *exhorting* glorious war. *Milton.*

These words,—have a fit coherence with those that precede,—especially considering St. Paul's style and manner of expression in the preceptive and *exhortative* part of his epistles. *Barrow.*

Our Saviour, by the example of his holy life, continual instruction, and vehement *exhortations,* assayed to procure a belief of and submission to his most excellent doctrine. *Id.*

If we will not encourage public beneficence, still we are secure that no storm shall overturn what we help to build, there is no room for *exhortations* to charity. *Atterbury.*

EXI'CCATE, *v. a* | Lat. *exsicco.* To dry;
EXICCA'TION, *n. s.* | to dry up. Arefaction;
EXICCATIVE. *adj.* | act of drying up; state
of being dried up. More properly EXSICCATE, which see.

What is more easily refuted than that old vulgar assertion of an universal drought and *exiccation* of the earth? As if the sun could evaporate the least drop of its moisture, so that it should never descend again, but be attracted and elevated quite out of the atmosphere. *Bentley.*

EXI'GENCE, or | Fr. *exigence;* Lat.
EXI'GENCY, *n. s.* | *exigens, exigo, ex* and
EXI'GENT, *adj.* & *n. s.* | *ago;* Greek, αγω, to
drive or bring. Need; peremptory occasion; demand. Exigent, as an adjective, mean pressing, urgent.

As men, we are at our own choice, both for time and place and form, according to the *exigence* of our own occasions in private. *Hooker.*

In such an *exigent* I see not how they could have staid to deliberate about any other regiment than that which already was devised to their hands. *Id. Preface.*

These eyes, like lamps whose wasting oil is spent,
Wax dim, as drawing to their *exigent.* *Shakspeare.*

It is apparent, that the civil law in this kingdom, had not in the least degree the ability to help or to hurt the church, in any *exigency,* as the common law had. *Clarendon.*

The council met, your guards to find you sent,
And know your pleasure in this *exigent.* *Waller.*

If I find that my enemies shall take advantage of my silence to begin hostilities upon me, or if any other *exigency* of affairs may so require, since I see elections in so great forwardness, we may possibly meet before the day appointed; or, if matters go on to my satisfaction, I may perhaps put off the meeting to a further day; but of this public notice shall be given. *Spectator*

This dissimulation in war may be called stratagem and conduct; in other *exigencies* address and dexterity. *Broome.*

You have heard what the present condition and *exigencies* of these several charities are. *Atterbury.*

While our fortunes exceed not the measure of real convenience, and are adapted to the *exigencies* of our station, we perceive the hand of Providence in our gradual and successive supplies. *Rogers.*

Now in such *exigencies* not to heed,
Upon my word you must be rich indeed!
A noble superfluity it craves,
Not for yourself, but for your fools and knaves. *Pope.*

Henry II. being then at peace with England, the queen represented that they could not expect him to take part in their quarrel, but upon views of personal advantage; and that, without extraordinary concessions in his favour, no assistance, in proportion to their present *exigencies,* could be obtained. *Robertson's History of Scotland.*

At this *exigent* moment the loss of a finished man is not easily supplied. *Burke.*

EXIGENT, in law, a writ sued out when the defendant is not to be found, being part of the process leading to an outlawry. The writ of exigent is directed to the sheriff, to proclaim and call the absent defendant five county-court days, one day after another, charging him to appear under the pain of outlawry. When a person indicted for felony, &c. absents himself so long, that the writ of exigent is awarded against him, such a withdrawing will be deemed a flight in law, whereby he is liable to forfeit his goods; and though he afterwards renders himself on the exigent, and is found not guilty, it is said the forfeiture shall stand; but if the party was in prison, or beyond the seas, he, or his executors, may reverse the reward of the exigent, by writ of error. Upon all exigents a proclamation shall be issued out to make proclamations in the county where the defendant dwells, for him to yield himself, &c.

EXIGENTERS, four officers in the court of common pleas, who make all exigents and proclamations in actions where process of outlawry lies. Writs of supersedeas, as well as the prothonotaries, upon exigents, were likewise drawn up in their office.

EXIGU'ITY, *n. s.* | Lat. *exiguitas.* Small-
EXIG'UOUS, *adj.* | ness; diminutiveness.

The *exiguity* and shape of the extant particles is now supposed. *Boyle on Colours.*

Their subtile parts and *exiguous* dose are consumed and evaporated in less than two hours' time. *Harvey.*

EX'ILE, *n. s.* & *v. a.* | Old Fr. *exil* and
EXILI'TION, *n. s.* | *exile;* Lat. *exilium, ex-*
EXILE'MENT, *n. s.* | *ilio, ex* and *salio,* to
spring or start out. Banishment; the person banished or living in habitual absence from his native country: to banish or drive from a country. Exilition is used with strict etymological propriety by Browne for rushing forth or springing out.

They, fettered with the bonds of a long night, lay there *exiled* from the eternal Providence. *Wisdom* xvii. 2.

Our state of bodies would bewray what life
We've led since thy *exile.* *Shakspeare.*
Welcome is *exile,* welcome were my death. *Id.*

Let them pronounce the steep Tarpeian death,
Vagabond *exile*, flaying, pent to linger,
But with a grain of day; I would not buy
Their mercy at the price of one fair word. *Shakspeare.*

For that offence,
Immediately we do *exile* him hence. *Id.*

Call home our *exiled* friends abroad,
That fled the snares of watchful tyranny. *Id.*

Fitzosborn was discarded into foreign service for a pretty shadow of *exilement*. *Wotton.*

From saltpetre proceedeth the force and report of gunpowder; for sulphur and small-coal mixt, will not take fire with noise or *exilition;* and powder, which is made of impure and greasy petre, hath but a weak emission, and gives but a faint report. *Browne.*

Nothing is more certainly bad, or more displeasing to God, than that which rendereth us in our complexion of mind, or in our behaviour, unlike to God: we thereby become *exiles* and aliens from his name and family. *Barrow.*

Arms and the man I sing, who forced by fate,
And haughty Juno's unrelenting hate,
Expelled and *exiled*. *Dryden.*

O must the wretched *exiles* ever mourn,
Nor after length of rolling year return? *Id.*

Ulysses, sole of all the victor train,
And *exile* from his dear paternal coast,
Deplored his absent queen, and empire lost. *Pope.*

A small body of the nobles, however, continuing faithful to their *exiled* prince, drove Baliol out of Scotland. *Robertson's History of Scotland.*

EXI'LE, *adj.* } Lat. *exilis; ex* and *ile*, the
Exi'lity, *n. s.* } flank; the thin part of the body. Weak; thin; slenderness; smallness; diminution.

In a virginal, when the lid is down, it maketh a more *exile* sound than when the lid is open. *Bacon.*

Certain flies, called ephemera, live but a day; the cause is the *exility* of the spirit, or perhaps the absence of the sun. *Id.*

For *exility* of the voice, or other sounds, it is certain that the voice doth pass through solid and hard bodies, if they be not too thick. *Id.*

A body, by being subtilized, can lose nothing of its corporeity; neither can it hereby gain any thing but *exility;* for all degrees of subtility are essentially the same thing. *Grew.*

Exile. Among the Romans exilium properly signified an interdiction or exclusion from water or fire; the necessary consequence of which was, that the interdicted person must betake himself into some other country, since there was no living without fire and water. Thus Cicero, ad Herenn, observes that the form of the sentence did not express exilium, but only aquæ et ignis interdictio: and that 'exile was not properly a punishment, but a voluntary flying and avoiding the punishment decreed.' He adds, that there was no crime among the Romans, as among other nations, punished with exile; but it was a resource to which people flew voluntarily, to avoid chains, ignominy, starving, &c. The Athenians often sent their great men into exile, from envy of their merits, or jealousy of their popularity. See Ostracism.

EXIM'IOUS, *adj.* Lat. *eximius.* Famous; eminent; conspicuous; excellent.

About him (the Holy Spirit), this excellent part of our duty, this *eximious* worship is conversant. *Barrow.*

EXIN'ANITE, *v. a.* } Fr. (old) *exinanir*,
Exinani'tion, *n. s.* } Lat. *exinanio;* to empty or discharge. To make empty; spoil; weaken; according to our older vocabularies. The Rhemish version of Philippians ii. 7, seems to retain this old verb very properly. 'He brought himself from all things as it were to nothing,' is the Geneva English explanation, 1560.

He *exinanited* himself and took the form of a servant. *Phil.* ii. 7. *Rhemish* N. T.

He is not more impotent in his glory, than he was in his *exinanition*. *Decay of Piety.*

EXIST', *v. n.* } Fr. *exister;* Lat. *existo;*
Exist'ence, or } (*ex* and *sisto*, à Gr. ἱστω)
Exist'ency, *n. s.* } to be. To have being: state
Exist'ent, *adj.* } of being; a being: existent, is in possession of existence.

Whatsoever sign the sun possessed, whose recess or vicinity defineth the quarters of the year, those seasons were actually *existent*. *Browne.*

Nor is only the *existency* of this animal considerable, but many things delivered thereof. *Id.*

It is impossible any being can be eternal with successive eternal physical changes, or variety of states or manner of *existency*, naturally and necessarily concomitant unto it. *Hale.*

The eyes and mind are fastened on objects which have no real being as if they were truly *existent*. *Dryden.*

It seems reasonable to enquire, how such a multitude comes to make but one idea, since that combination does not always *exist* together in nature. *Locke.*

The principium individuationis is *existence* itself, which determines a being of any sort to a particular time and place, incommunicable to two beings of the same kind. *Id.*

It is as easy to conceive that an Almighty power might produce a thing out of nothing, and make that to *exist* de novo which did not *exist* before; as to conceive the world to have had no beginning, but to have *existed* from eternity. *South.*

The soul, secured in her *existence*, smiles
At the drawn dagger, and defies its point. *Addison.*

One year is past, a different scene!
No farther mention of the dean:
Who now, alas, no more is mist
Than if he never did *exist*. *Swift.*

When a being is considered as possible, it is said to have an essence or nature: such were all things before the creation. When it is considered as actual, then it is said to have *existence* also. *Watts.*

The intense view of these manifold contradictions and imperfections in human reason has so wrought upon me, and heated my brain, that I am ready to reject all belief and reasoning, and can look upon no opinion even as more probable or likely than another. Where am I, or what? From what causes do I derive my *existence*, and to what condition shall I return? Whose favour must I court, and whose anger must I dread? What beings surround me? *Hume on Human Nature.*

They are as well instructed, judicious, and prudent a people as *exist* any where in the world, all professing, like myself, to be lovers of economy. *Franklin.*

The objects which at that time warmed and interested both nations, *exist* no longer. *Robertson's History of Scotland.*

No government ought to own that it *exists* for the purpose of checking the prosperity of its people, or that there is such a principle involved in its policy. *Burke.*

Poetry is the art of substantiating shadows, and of ending *existence* to nothing. *Id.*

The next the fleeting images select,
Of action, suffering, causes and effect;
Or mark *existence*, with the march sublime
O'er earth and ocean of recording Time.
*Darwin.*

E'XIT, *n. s.* } Lat. *exit;* he departs. Re-
EXI'TIAL, *adj.* } cess; departure; a term set in
EXI'TIOUS. } the margin of plays to mark the time at which the player goes off the stage; passage or way out; death. The adjectives signifying destructive, mortal, &c., are obsolete.

All the world's a stage,
And all the men and women merely players;
They have their *exits* and their entrances,
And one man in his time plays many parts.
*Shakspeare.*

In such a pervious substance as the brain, they might find an easy either entrance or *exit*, almost every where. *Glanville.*

Most *exitial* fevers, although not concomitated with the tokens, exanthemata, anthraces, or carbuncles, are to be censured pestilential. *Harvey.*

The fire makes its way, forcing the water forth through its ordinary *exits*, wells, and the outlets of rivers. *Woodward.*

A regard for fame becomes a man more towards the *exit* than at his entrance into life. *Swift.*

To solve the mystery, but in vain;
Stand still and breathe, and take from me
A clew that soon shall set you free!
Not Ariadne, if you meet her,
Herself could serve you with a better;
You entered easily—find where—
And make, with ease, your *exit* there! *Cowper.*

EXITERIA, in antiquity, oblations or prayers to the gods for a prosperous journey: also feasts celebrated by the Greeks with sacrifices, when their generals undertook expeditions against an enemy.

EXOCCETUS, or the flying fish, in ichthyology, a genus belonging to the order of abdominales. The head is scaly, and it has no teeth; it has ten radii in the branchiostege membrane; the body is whitish, and the belly is angular: the pectoral fins, the instruments of flight, are very large. When pursued by any other fish, it raises itself from the water by these long fins, and flies in the air to a considerable distance, till the fins dry, and then it falls down into the water. This fish is caught in the Mediterranean and some other seas. It is most common between the tropics, and there its enemies are most numerous. In these climates the flying fishes spring out of the water by hundreds, to escape the rapacity of the dolphins, sharks, dorados, &c. When flying, they have as formidable enemies to encounter in the air, viz. the pelican, eagle, diomedea, &c. and frequently throw themselves on board the ships to escape their pursuit. Their flesh is said to be palatable and nourishing food.

EXODIUM, in the ancient Greek drama, one of the four divisions of tragedy; the part that included the catastrophe and unravelling of the plot; answering nearly to our fourth and fifth acts.

EXODIUM, among the Romans, consisted of certain humorous verses rehearsed by the exodiary at the end of the fabulæ atellanæ.

EXODIUM, in the Septuagint, signifies the end or conclusion of a feast. It is particularly used for the eighth day of the feast of tabernacles, which, it is said, had a special view to the commemoration of the exodus or departure out of Egypt.

EX'ODUS, *n. s.* } Gr. εξοδος, departure.
EX'ODY. } The second book of the Bible. See below. A departure or journey, and particularly that of the Israelites from Egypt.

In all probability their years continued to be three hundred and sixty-five days, ever since the time of the Jewish *exody* at least. *Hale.*

EXODUS, (Εξοδος, going out), the second of the five books of Moses, and of the books of the Bible; so called originally by the Septuagint translators, from the principal circumstance recorded in it; i. e. the departure of the Israelites from Egypt. It contains also the history of what was transacted in Egypt from the death of Joseph to the departure of the Jews; as well as what passed in the wilderness, and particularly at mount Sinai, to the building of the tabernacle. The Jews and the Hebrew copies of the Old Testament call it ואלה שמות, ve-alehu shemoth, q. d. hæc nomina, 'these are the names' from their being the initial words of the book. It comprises a period of about 145 years; or from A.M. 2369 to A.M. 2514 inclusive: and contains the earliest instance of alphabetical writing recorded in history; i. e. the inscription of the law or ten commandments, said to be written 'by the finger of God' on the tables of stone. Exod. xxxi. 8.

EXO'LVE, *v. a.* } Lat. *exolvo.* To loose:
EXOLU'TION, *n. s.* } hence to pay a debt. Laxation of the nerves.

Considering the *exolution* and languor ensuing that action in some, we cannot but think it much abridgeth our days. *Browne's Vulgar Errours.*

EXOM'PHALOS, *n. s.* Greek, ἐξ out, and ομφαλος, the navel.

*Exomphalos* is an umbilical hernia, or a disease which consists of a protrusion of some of the abdominal viscera at the navel. *Dr. A. Rees.*

EXOMPHALOS. See HERNIA.

EXON'ERATE, *v. a.* } Lat. *exonero*, from
EXONERA'TION, *n. s.* } *ex* privative, and *onus*, *oneris*, a burden; à Gr. ονος, an ass. To disburden; unload: hence to free from charge or obligation.

The glands being a congeries of vessels curled, circumgyrated, and complicated, give the blood time to separate through the capillary vessels into the secretory ones, which afterwards all *exonerate* themselves into one common ductus. *Ray.*

The body is adapted unto eating, drinking, nutrition, and other ways of repletion and *exoneration*. *Grew.*

EXOPHTHALMIA, from εξ, out, and οφθαλμος, the eye, in surgery, a disease consisting of a protrusion, or a preternatural projection of the globe of the eye from the orbit, so that the part cannot be duly covered by the eye-lids. The disorder may proceed either from a morbid enlargement of the eye-ball, or what, perhaps, is a still more common cause, some tumor which occupies or diminishes the cavity of the orbit,

and consequently displaces the eye. See MEDICINE and SURGERY.

EX'ORABLE, *adj.* Fr. and Span. *exorable;* Ital. *essorabile;* Lat. *exorabilis* (*exoro,* to get by entreaty). Easy to be entreated.

Wisdom discovers our relations, duties, and concernments, in respect of. men—prompts us to bear the infirmities of our brethren, to be gentle in our censures,—to be patient, *exorable,* and reconcileable to those that give us greatest cause of offence. *Barrow.*

EXOR'BITANCE, or EXOR'BITANCY, *n. s.* EXOR'BITANT, *adj.* EXOR'BITANTLY, *adv.* EXOR'BITATE, *v. n.* Fr. *exorbitant;* Italian, *essorbitante;* Span. and Port. *exorbitante;* Lat. *exorbitans,* from *ex* and *orbis,* a circle. That which is out of bounds or due limits; the act of deviation from rule. Exorbitant is eccentric; excessive. To exorbitate is used with strict propriety, by our old writers, for to deviate from an orbit.

The Jews, who had laws so particularly determining in all affairs what to do, were notwithstanding continually inured with causes *exorbitant,* and such as their laws had not provided for. *Hooker.*

The reverence of my presence may be a curb to your *exorbitancies.* *Dryden's Spanish Friar.*

What signifies the fiction of the tortoise riding upon the wings of the wind, but to prescribe bounds and measures to our *exorbitant* passions? *L'Estrange.*

The ways of iniquity and vanity (if we may call them ways, which indeed are but *exorbitances* and seductions from the way), are very unintelligible, very obscure, abstruse, and intricate. *Barrow.*

For then mankind will be in a far worse condition than in the state of nature, if they shall have armed one, or a few men with the joint power of a multitude, to force them to obey at pleasure the *exorbitant* and unlimited decrees of their sudden thoughts, or unrestrained, and till that moment unknown wills, without having any measures set down which may guide and justify their actions. *Locke.*

Their subjects would live in great plenty, were not the impositions so very *exorbitant;* for the courts are too splendid for the territories. *Addison.*

I see some of this fault cleave to those, who have eminently corrected all other *exorbitancies* of the tongue. *Government of the Tongue.*

These phenomena are not peculiar to earthquakes in our times, but have been observed in all ages, and particularly those *exorbitant* commotions of the waters of the globe. *Woodward's Natural History.*

They riot still,
Unbounded in *exorbitance* of ill. *Garth.*

The planets sometimes would have approached the sun as near as the orb of mercury, and sometimes have *exorbitated* beyond the distance of Saturn. *Bentley.*

The people were grossly imposed on, to commit such *exorbitancies* as could not end but in the dissolution of the government. *Swift.*

So endless and *exorbitant* are the desires of men, that they will grasp at all, and can form no scheme of perfect happiness with less. *Id.*

This was not owing to the inattention of our princes, or their want of ambition. They were abundantly sensible of the *exorbitant* power of the nobility, and extremely solicitous to humble that order. *Robertson's History of Scotland.*

Where this is the case, there must be in the hands of certain individuals some *exorbitant* power productive of oppression, and not subject to law; or there must prevail in the state a spirit of licentiousness which the law cannot control. *Beattie.*

EX'ORCISE, *v. a.* EX'ORCISER, *n. s.* EX'ORCISM, EX'ORCIST. Fr. *exorcisir, exorcisme:* Ital. *exorcismo;* Spanish and Port. *exorcismo;* Lat. *exorcismus;* Gr. ἐξορκισμος (from ἐξ, out, and ορκιζω, to adjure). To adjure evil spirits to depart, by some supposed holy name or influence. See below.

Summe of the iewis *exorcistis* gheden about and assaieden to clepe the name of the lord ihesu crist on hem that hadden yuele spiritis. *Wiclif. Dedis.* 19.

Soul of Rome!
Thou, like an *exorcist,* had conjured up
My mortified spirit. *Shakspeare. Julius Cæsar.*

Will his lordship behold and hear our *exorcisms?* *Id.*

Symptoms supernatural must be only curable by supernatural means; namely, by devout prayers or *exorcisms.* *Harvey.*

And fryers, that through the wealthy regions run,
Resort to farmers rich, and bless their halls,
And *exorcise* the beds, and cross the walls. *Dryden.*

Ye glowing embers,
—Who blaze or die, as great Jehovah's breath
Or blows you or forbears, assist my song;
Pour your whole influence; *exorcise* his heart,
So long possessed, and bring him back to man. *Young.*

*The practice of* EXORCISM was carried to a great extent among the Jews, and Josephus relates several wonderful tales of the success of exorcists. One Eleazer, a Jew, cured many dæmoniacs, he informs us, by means of a root set in a ring. This root, with the ring, was held under the patient's nose, and the devil was forthwith expelled. M. Fleury mentions certain people among the Jews who travelled round the country, making profession of driving out devils by invocations, which, they pretended, had been taught them by Solomon; these were also called exorcists. See *Joseph. Antiq. Jud.* lib. viii. *Origen. Tract.* xxxv. in *Matt.* xxxv. 63.

Exorcisms are greatly used in the church of Rome, the rituals of which forbid exorcising without leave of the bishop. The ceremony is performed at the lower end of the church, towards the door. The exorcist first signs the possessed person with the sign of the cross, makes him kneel, and sprinkles him with holy water. Then follow the litanies, psalms and prayer; after which the exorcist asks the devil his name, and adjures him by the mysteries of the Christian religion not to afflict the person any more: then, laying his right hand on the dæmoniac's head, he repeats the form of exorcism. The Romanists have a similar form for the exorcising of houses, which may be found in Brown's Papal Antiquities. Selden has said, 'casting out devils is mere juggling; they never cast out any but what they first cast in.'

Exorcisms had anciently another acceptation; being applied by way of trial or purgation to extort the truth from the accused. The exorcism, in this sense, was a sort of bread conjured and exorcised for the purpose; and the opinion was, that if the person was criminal he could

not swallow the bread. This, it seems, was a frequent practice in the time of our Edward III. and the bread thus exorcised was said to be corsned. Linderbroeck gives instances of exorcisms with barley-bread, and others with cheese.

EXORCIST, in the Romish church, is a priest, or tonsured clerk, who has received the four lesser orders, one of which is that of exorcist. The term is likewise applied to a prelate, or to a priest delegated by a prelate, who actually exorcises a person possessed.

The ordination of exorcists is performed in the time of mass, their principal office being to expel devils. The fourth council of Carthage, can. 7, appoints, that at the ordination of exorcists, the bishop, putting the book of exorcisms in their hands, shall say these words; 'Receive it, and keep it in remembrance, and have power to lay hands on energumeni, whether baptised or catechumens;' which form still obtains.

It is a dispute among divines whether ever the Greeks had any such order as that of exorcist. Fa. Goar, in his Notes on the Greek Euchologion, has made it probable they had, from several concurring passages in St. Dionysius and St. Ignatius Martyr.

EXOR'DIAL, *adj.* } Fr. *exorde;* Lat. *ex-*
EXOR'DIUM, *n. s.* } *ordium*, a preface. Introductory: an introduction.

I cannot forbear to allege that so grave and pertinent speech of Cicero, which is the *exordium* of his oratio ad Pontifices. *Barrow.*

Nor will I thee detain
With poets' fictions, nor oppress thine ear
With circumstance, and long *exordiums* here.
*May's Virgil.*

I have been distasted at this way of writing, by reason of long prefaces and *exordiums*. *Addison.*

EXORNA'TION, *n. s.* Lat. *exornatio.* Ornament; decoration; embellishment.

It seemeth that all those curious *exornations* should rather cease. *Hooker.*

Hyperbolical *exornations* and elegancies many much affect. *Hale.*

EXOS'SEOUS, *adj.* } Lat. *ex* and *ossa.*
EXOS'SEATED. } Wanting bones; boneless; formed without bones.

Thus we daily observe in the heads of fishes, as also in snails and soft *exosseous* animals, nature near the head hath placed a flat white stone, or testaceous concretion. *Browne.*

EXOTERIC and ESOTERIC, terms denoting external and internal, applied to the double doctrine of the ancient philosophers; the former public, the latter secret. The exoteric was that which they openly professed and taught to the world; the esoteric was confined to a small number of chosen disciples. This method was derived originally from the Egyptians; who, according to Herodotus, Diodorus Siculus, Strabo, Plutarch, &c., had a twofold philosophy, one secret and sacred; the other public and common. The same practice also obtained among the Persian Magi, the Druids of the Gauls, and the Brachmans of India. The Egyptian priests, with whom it originated, sustained the character of judges and magistrates, and probably introduced this distinction to serve the purposes of legislation and government. Clement of Alexandria informs us, that they communicated their mysteries principally to those concerned in the administration of the state; and Plutarch confirms this. Others have supposed, that they invented the fables of their gods and heroes, and the other external ceremonies of their religion, to disguise natural and moral truths; but, whatever was the motive of their practice, it was certainly applied to political purposes.

EXOSTO'SIS, *n. s.* Fr. *exostose;* Gr. εξ, out of, and οστεον, a bone. Any protuberance of a bone that is not natural.

The particular kind of tumour which occasionally forms on the surface of the bones, is that to which this writer (Bayer) assigns the appellation of *exostosis.* He notices, however, that this name comprehends different species, which should be considered in a distinct manner. *Dr. A. Rees.*

EXOT'IC, or } Fr. *exotique;* Ital.
EXOT'ICK, *adj.* & *n. s.* } *esotico*, Span. and Port.
EXOT'ICAL, *adj.* } *exotico;* Lat. *exoticus;* Gr. εξωτικος, ab, εξω, extra (Minsheu). Foreign, not of home produce, not domestic: applied particularly, as a substantive, to plants.

Some learned men treat of the nature of letters as of some remote *exotick* thing, whereof we had no knowledge but by fabulous relations. *Holder.*

Continue fresh hot-beds to entertain such *exotick* plants as arrive not to their perfection without them.
*Evelyn's Kalendar.*

Crowded theatres, too fondly proud of their *exotic* minstrels and shrill pipes. The price of manhood, hail thee with a song, and airs soft warbling
*Somervile.*

Claudian was seated on the other summit, which was barren, and produced, on some spots, plants that are unknown to Italy, and such as the gardeners call *exoticks.* *Addison's Guardian.*

Sometimes retiring, from the public weal
One tranquil hour the royal partners steal;
Through glades *exotic* pass with step sublime,
Or mark the growths of Britain's happier clime.
*Darwin.*

Some Russian Roscius next delight the age,
And a Dutch Cleinel skate along the stage.
*Exotic* fopperies, hail! whose flattering smile
Supplants the sterner virtues of our isle. *Sheridan.*

Many and beautiful lay those around,
Like flowers of different hue and clime and root
In some *exotic* garden sometimes found,
With cost, and care, and warmth induced to shoot.
*Byron.*

EXPAND', *v. a.* } Lat. *expando*, *ex* out,
EXPAN'SE, *n. s.* } and *pando* (Gr. φαινω,
EXPAN'SIBILITY, } φανω), to open. To
EXPAN'SIBLE, *adj.* } spread; lay open; dilate;
EXPAN'SILE, *adj.* } diffuse: an expanse is a
EXPAN'SION, *n. s.* } body, or space, equally
EXPAN'SIVE, *adj.* } diffused: expansibility, capacity of extension: expansible and expansive, capable of being extended: expansion, the act of spreading out, or the state of being expanded; extent

She useth most the target to fence away the blow, and leaves all other weapons to the Alcoran to propagate and *expand* itself. *Howel.*

A murmuring sound
Of waters issue from a cave, and spread
Into a liquid plain; then stood unmoved,
Pure as the *expanse* of heaven. *Milton.*

Bellerophon's horse, framed of iron, and placed between two loadstones, with wings *expanded*, hung pendulous in the air. *Browne.*

The capacious mind of man cannot be confined by the limits of the world: it extends its thoughts even beyond the utmost *expansion* of matter, and makes incursions into that incomprehensible inane. *Locke.*

The elastick or *expansive* faculty of the air, whereby it dilates itself when compressed, hath been made use of in the common weather glasses. *Ray.*

Bodies are not *expansible* in proportion to their weight, or to the quantity of matter to be expanded. *Grew.*

With the rotundity common to the atoms of all fluids, there is some difference in bulk, by which the atoms in one fluid are distinguished from those of another; else all fluids would be alike in weight, *expansibility*, and all other qualities. *Id.*

It would for ever take an useless flight,
Lost in *expansion*, void and infinite. *Blackmore.*

An animal growing, *expands* its fibres in the air as a fluid. *Arbuthnot on Air.*

'Tis demonstrated that the condensation and *expansion* of any portion of the air is always proportional to the weight and pressure incumbent upon it. *Bentley.*

Bright as the ethereal glows the green *expanse*. *Savage.*

Along the stream of time thy name
*Expanded* flies, and gathers all its fame. *Pope.*

On the smooth *expanse* of crystal lakes,
The sinking stone at first a circle makes;
The trembling surface, by the motion stirred,
Spreads in a second circle, then a third;
Wide, and more wide, the floating rings advance,
Fill all the watery plain, and to the margin dance. *Id.*

The *expansive* atmosphere is cramped with cold. *Thomson.*

O thou bright queen, who o'er the *expanse*
Now highest reign'st, with boundless sway!
Oft has thy silent-marking glance
Observed us, fondly-wandering, stray. *Burns.*

Here various motives his ambition raise—
Power, pomp, and splendour, and the thirst of praise;
There beauty woos him with *expanded* arms;
E'en bacchanalian madness has its charms. *Cowper.*

O'er ten square leagues her pennons broad *expand*
And twilight swims upon the shuddering sand. *Darwin.*

The matter of heat is an ethereal fluid, in which all things are immersed, and which constitutes the general power of repulsion, as appears in explosions which are produced by the sudden evolution of combined heat, and by the *expansion* of all bodies by the slower diffusion of it in its uncombined state. *Id.*

There is another power in nature, besides that of *expansile* vapour, which may have raised some materials which have previously been in igneous or aqueous solution; and that is the act of congelation. *Id.*

Seen on yon sky-mixed mountain's brow,
The mingling multitudes, the madding car
Pouring impetuous on the plain below,
War's dreadful lord proclaim.
Bursts out by frequent fits the *expansive* flame.
Whirled in tempestuous eddies flies
The surging smoke o'er all the darkened skies. *Beattie.*

Their azure arches through the long *expanse*
More deeply purpled meet his mellowing glance;
And tenderest tints, along their summits driven,
Mark his gay course—and own the hues of heaven. *Byron.*

She looked (this simile's quite new) just cut
From marble, like Pigmalion's statue waking,
The mortal and the marble still at strife,
And timidly *expanding* into life. *Id. Don Juan.*

Expansion, in physiology, is the dilating, stretching, or spreading out of a body; whether from any external cause, as rarefaction, or from an internal cause, as elasticity. All bodies, whether solid or fluid, naturally expand by heat beyond their dimensions when cold; and hence their dimensions are different in different temperatures and seasons of the year. Air compressed or condensed, as soon as the compressing or condensing force is removed, expands by its elastic power, to its former dimensions. In some few cases, however, bodies seem to expand as they grow cold, as water in the act of freezing: but this is owing to the extrication of a number of air bubbles from the fluid, and is not at all a regular and gradual expansion like that of metals, &c., by heat. In certain metals, also, an expansion takes place when they pass from a fluid to a solid state: but this is not any proper effect of cold, but of the arrangement of the parts of the metals, and is, therefore, to be accounted rather a kind of crystallisation. The expansion of different bodies by heat is very various; and many experiments upon it are inserted in the Philosophical Transactions. In the forty-eighth volume, Mr. Smeaton gave a table of the expansion of many different substances, as determined by experiment, from which the following particulars are extracted. The quantities of expansion which answer to 180° of Fahrenheit's thermometer are expressed in 10,000th parts of an English inch, each substance being twelve inches in length.

| | |
|---|---|
| White glass barometer tube | 100 |
| Martial regulus of antimony | 130 |
| Blistered steel | 138 |
| Hard steel | 147 |
| Iron | 151 |
| Bismuth | 167 |
| Copper hammered | 204 |
| Copper 8 parts, mixed with 1 of tin | 218 |
| Cast brass | 225 |
| Brass 16 parts, with tin 1 | 229 |
| Brass wire | 232 |
| Speculum metal | 232 |
| Spelter solder, viz. brass 2 parts, zinc 1 | 247 |
| Fine pewter | 274 |
| Grain tin | 298 |
| Soft solder, viz. lead 2, tin 1 | 301 |
| Zinc 8 parts, tin 1, a little hammered | 323 |
| Lead | 344 |
| Zinc or spelter | 353 |
| Zinc hammered half an inch per foot. | 373 |

By other experiments too it has been found that, for each degree of heat of the thermometer, mercury, water, and air, expand by the following parts of their own bulk, viz. mercury the 9600th; water the 6666th; air the 435th. From the above table it appears, that there is no general rule for the degree of expansion to which bodies are subject by the same degree of heat, either from their specific gravity or otherwise. Zinc, which is much lighter than lead, expands more with heat; while glass, which is lighter

than either, expands much less; and copper, which is heavier than a mixture of brass and tin, expands less. It seems too that metals observe a proportion of expansion in a fluid state, quite different from what they do in a solid one: for regulus of antimony seemed to shrink in fixing, after being melted, considerably more than zinc. The following table will give the reader an idea of the proportionate rate of expansion of liquids as far as they have been examined.

| Temp. | Mercury. | Linseed oil. | Sulphuric acid. | Nitric acid. | Water. | Oil of turpentine. | Alcohol. |
|---|---|---|---|---|---|---|---|
| 30° | 100000 | 100000 | — | — | — | — | 100000 |
| 40 | 100081 | — | 99752 | 99514 | — | — | 100539 |
| 50 | 100183 | — | 100000 | 100000 | 100023 | 100000 | 101105 |
| 60 | 100304 | — | 100279 | 100486 | 100091 | 100460 | 101688 |
| 70 | 100406 | — | 100558 | 100990 | 100197 | 100993 | 102281 |
| 80 | 100508 | — | 100806 | 101530 | 100332 | 101471 | 102890 |
| 90 | 100610 | — | 101054 | 102088 | 100694 | 101931 | 103517 |
| 100 | 100712 | 102760 | 101317 | 102620 | 100908 | 102446 | 104162 |
| 110 | 100813 | — | 101540 | 103196 | — | 102943 | — |
| 120 | 100915 | — | 101034 | 103776 | 101404 | 103421 | — |
| 130 | 101017 | — | 102097 | 104352 | — | 103954 | — |
| 140 | 101119 | — | 102320 | 105132 | — | 104573 | — |
| 150 | 101220 | — | 102614 | — | 102017 | — | — |
| 160 | 101322 | — | 102893 | — | — | — | — |
| 170 | 101424 | — | 103116 | — | — | — | — |
| 180 | 101526 | — | 103339 | — | — | — | — |
| 190 | 101628 | — | [illegible] | — | 103617 | — | — |
| 200 | 101730 | — | 103911 | — | — | — | — |
| 212 | 101835 | 107250 | — | — | 104577 | — | — |

After bodies are reduced to a vaporous state, their expansion seems to go on without any limitation, in proportion to the degree of heat applied; so that it is impossible to say what would be the ultimate effects of that principle upon them in this way. The force with which these vapors expand, on the application of high degrees is very great; nor does it appear that any obstacle, whatever, is insuperable by them. On this principle depends the steam engine, the instruments called manometers, which show the variation of gravity in the external atmosphere, by the expansion or condensation of a small quantity of air confined in a proper vessel, &c. &c.; a variety of other curious machines may be constructed on the principle of aerial expansion; an account of which will be found under HYDROSTATICS and PNEUMATICS. On the principle of the expansion of fluids are constructed thermometers: and for the effects of the different expansions of metals in correcting the errors of machines for measuring time, see PENDULUM. The expansion of solid bodies is measured by the pyrometer; and the force with which they expand is still greater than that of aerial vapors; the flame of a farthing candle produces an expansion in a bar of iron capable of counteracting a weight of 500 pounds. The quantity of expansion, however, is so small, that it has never been applied to the movement of any mechanical engine.

EXPATIATE, *v. n.* & *v. a.* Lat. *expatior*, to walk abroad. To range; to wander beyond limits: hence to dilate, or enlarge upon, in words. Johnson notices the active use of it by Dryden as 'very improper.' But Mr. Todd supplies another instance of it from Bp. Sprat. See below.

Make choice of a subject, which, being of itself capable of all that colors and the elegance of design can possibly give, shall afterwards afford an ample field of matter wherein to *expatiate* itself. *Dryden.*

They were not allowed to *expatiate* or amplify or connect, specious arguments together. *Bp. Sprat.*

Religion contracts the circle of our pleasures, but leaves it wide enough for her votaries to *expatiate* in. *Addison's Spectator.*

They had a custom of offering the tongues to Mercury, because they believed him the giver of eloquence: Dacier *expatiates* upon this custom. *Broome.*

He looks in heaven with more than mortal eyes,
Bids his free soul *expatiate* in the skies;
Amidst her kindred stars familiar roam,
Survey the region, and confess her home. *Pope.*

EXPATRIATE, *v. a.*, EXPATRIA'TION, *n. s.* Fr. *expatrier*, from *ex*, and Lat. *patria*, country. To banish any one from his native land.

Abeillard indulged the romantic wish of *expatriating* himself for ever. *Berington.*

EXPECT', *v. a.* & *v. n.*, EXPECT'ABLE, *adj.*, EXPECT'ANCE, or, EXPECT'ANCY, *n. s.*, EXPECT'ANT, *n. s.* & *adj.*, EXPECTA'TION, *n. s.*, EXPECT'ER. Sp. and Port. *esperar*; Lat. *expecto*, *ex*, intensive, and *specto*, to mind. To apprehend, or wait for, good or ill; to attend the coming of: expectable is, to be hoped or feared: expectance or expectancy, the act or state of expecting, or the thing expected: expectant, as an adjective, is wishing for; and, as a substantive, the person who expects, and synonymous with expecter.

My soul, wait thou only upon God; for my *expectation* is from him. *Ps.* xlii. 5.

There is *expectance* here from both the sides,
What further you will do. *Shakspeare.*

Signify this loving interview
To the *expecters* of our Trojan part. *Id.*
The trees
Should have borne men, and *expectation* fainted.
Longing for what it had not. *Id.*
Every moment is *expectancy*
Of more arrivance. *Id. Othello.*
Satyrs leave your petulance,
Or else rail upon the moon,
Your *expectance* is too soon;
For before the second cock
Crow, the gates will not unlock.
*Ben Jonson.*

Needs must the serpent now his capital bruise
*Expect* with mortal pain. *Milton.*
Good with bad
*Expect* to hear, supernal grace contending
With sinfulness of man. *Id.*
We *expected*
Immediate dissolution. *Id.*
But fy, my wandering muse, how thou dost stay!
*Expectance* calls thee now another way. *Id.*
Now clear I understand,
What oft my steadiest thoughts have searched in vain,
Why our great *expectation* should be called
The Seed of woman. *Id. Paradise Lost.*

Occult and spiritual operations are not *expectable* from ice; for being but water congealed, it can never make good such qualities. *Browne.*

How fit it will be for you, born so great a prince, and of so rare not only *expectation* but proof, to divert your thoughts from the way of goodness. *Sidney.*

You first came home
From travel with such hopes as made you looked on,
By all men's eyes, a youth of *expectation*;
Pleased with your growing virtue I received you.
*Otway.*

This blessed *expectance* must be now my theme. *Boyle.*

While, *expecting* there the queen, he raised
His wondering eyes, and round the temple gazed.
*Dryden.*

We are not to intrench upon truth in any conversation, but least of all with children; since, if we play false with them, we not only deceive their *expectation*, and hinder their knowledge, but corrupt their innocence, and teach them the worst of vices. *Locke.*

Live in a constant and serious *expectation* of that day, when we must appear before the Judge of heaven and earth. *Rogers's Sermons.*

'Tis *expectation* makes a blessing dear.
*Co[illegible]re.*

They, vain *expectants* of the bridal hour,
My stores in riotous expence devour. *Pope.*

This treatise was agreeable to the whole nation, except those who had employments, or were *expectants.* *Swift to Pope.*

Her majesty has offered concessions, in order to remove scruples raised in the mind of the *expectant* heir. *Swift.*

These are not great *expecters* under your administration, according to the period of governors here. *Id.*

Forced to gratify to a certain degree the tories who supported him, but unwilling to make his reconcilement to the whigs utter desperate, he corresponded at once with the two *expectants* of the crown, and kept, as has been observed, the succession undetermined. *Johnson. Life of Swift.*

Never *expecting* to find perfection in men, and not looking for divine attributes in created beings, in my commerce with my contemporaries I have found much human virtue. *Burke.*

'Tis therefore many, whose sequestered lot
Forbids their interference, looking on,
Anticipate perforce some dire event;
And seeing the old castle of the state,
That promised once more firmness, so assailed,
That all its tempest-beaten turrets shake,
Stand motionless, *expectants* of its fall. *Cowper.*

Pleased, as they pass, she counts the glittering bands,
And stills their murm[illegible]ith h[illegible]; h[illegible],
Each listening tribe with fond *expectance* burns,
And now to these, and now to those she turns.
*Darwin.*

We foresee the event, but our *expectations* are not raised by it. The catastrophe is not brought about by any striking incident, but by a series of incidents that have little or nothing in them to engage or surprise the reader. *Beattie.*

EXPEC'TORATE, *v. a.* & *v. n.* }
EXPECTORA'TION, *n. s.* }
EXPEC'TORATIVE, *adj.* } Fr. *expectorer*; Lat. *expectore*, (*ex* and *pectore*) to throw from the breast. To discharge from the breast or lungs, as in coughing.

Syrups and other *expectoratives*, in coughs must necessarily occasion a greater cough. *Harvey.*

Excrementitious humours are *expectorated* by a cough after a cold or an asthma. *Id.*

M[illegible]bifick matter is either attenuated so as to be returned into the channels, or *expectorated* by coughing. *Arbuthnot.*

With water, vinegar, and honey, in pleurisies and inflammations of the lungs, he mixeth spices, for promoting *expectoration.* *Id. on Aliments.*

EXPE'DIENCE, or }
EXPE'DIENCY, *n. s.* }
EXPE'DIENT, *adj.* & *n. s.* }
EXPE'DIENTLY, *adv.* } Fr. *expedient*; Ital. and Span. *expediente*; Lat. *expediens*, *expedit*, it is fit, or needful. Fitness; propriety; suitableness; convenience: an expedient is that which assists, and so appears needful to an end; it is used also for a shift or contrivance in an exigency.

All things are not *expedient*: in things indifferent there is a choice; they are not always equally *expedient.* *Hooker.*

The adverse winds,
Whose leisure I have staid, have given him time
To land his legions all as soon as I:
His marches are *expedient* to this town. *Shakspeare.*

Let my officers of such a nature
Make an extent upon his house and lands:
Do this *expediently*, and turn him going. *Id.*
Let me hear
What yesternight our council did decree,
In forwarding this dear *expedience.* *Id.*
Eight tall ships, three thousand men of war,
Are making hither with all due *expedience.*
*Id. Richard II.*

And where such extraordinary commendations are wanting, is it not reasonable that the need of them should be supplied by ordinary and probable *expedients?* *Barrow.*

The *expediency* of things to be permitted or performed, doth not consist in single acts or events, but in many conspiring to one common end. *Id.*

When men live as if there were no God, it becomes *expedient* for them that there should be none; and then they endeavour to persuade themselves so. *Tillotson.*

Tho' *expedient* pleased, where neither lost his right;
Mars had the day, and Venus had the night.
*Dryden.*

Solemn dedications of things set apart for Divine Worship, could never have been universally practised, had not right reason dictated the high *expediency* and great use of such practices. *South.*

He flies to a new *expedient* to solve the matter, and supposes an earth of a make and frame like that of Des Cartes. *Woodward.*

God does not project for our sorrow, but our innocence; and would never have invited us to the one, but as an *expedient* to the other. *Decay of Piety.*

Were I as wealthy as a South-sea dream,
Wishing is an *expedient* to be poor. *Young.*

The true danger is, when liberty is nibbled away, for *expedients*, and by parts. *Burke.*

Canst thou, and honoured with a Christian name,
Buy what is woman born, and feel no shame?
Trade in the blood of innocence, and plead
*Expedience* as a warrant for the deed? *Cowper.*

Pursue the search, and you will find
Good sense and knowledge of mankind
To be at least *expedient*,
And, after summing all the rest,
Religion ruling in the breast
A principal ingredient. *Id.*

EXPEDITATION, in the forest laws, signifies the cutting out the balls of a dog's fore feet for the preservation of the king's game. Every one that keeps any great dog not expeditated, forfeits 3*s*. 4*d*. to the king. In mastiffs, not the ball of the feet, but the three claws are to be cut to the skin. Instit. part iv. p. 308. This was to be performed once in every three years, on every man's dog who lived near the forests, and even on the dogs of the foresters themselves.

EX'PEDITE, *v.a.* & *adj.*
EX'PEDITELY, *adv.*
EXPEDI'TION, *n. s.*
EXPEDI'TIOUS, *adj.*
EXPEDI'TIOUSLY, *adv.*
Fr. *expedier*; Lat. *expedio*, from *ex* and *pedio*, *pes*, *pede* (à Gr. πους, the foot), to free; quit; place at liberty. To disencumber; facilitate; hasten despatch: the adjective, and expeditious, mean quick; soon performed; nimble; swift.

Wholesome advice, and *expedite* execution in freeing the state of those monsters. *Sandys.*

Nature can teach the church but in part; neither so fully as is requisite for man's salvation, nor so easily as to make the way plain and *expedite* enough, that many come to the knowledge of it, and so be saved, and therefore the Scripture has been given. *Hooker.*

Prayers, whereunto devout minds have added a piercing kind of brevity, thereby the better to express that quick and speedy *expedition* wherewith ardent affections, the very wings of prayer, are delighted to present our suits in heaven. *Id.*

Even with the speediest *expedition*
I will dispatch him to the emperor's court. *Shakspeare.*

Young Octavius, and Mark Antony,
Come down upon us with a mighty power,
Bending their *expedition* tow'rd Philippi. *Id.*

Though such charters be *expedited* of course, and as of right, yet they are varied by discretion. *Bacon.*

He sent the lord chamberlain with *expedite* forces to speed to Exeter, to the rescue of the town. *Id. Henry VII.*

By sin and death a broad way now is paved,
To *expedite* your glorious march. *Milton.*

Can he be free and *expedite* in the discharge of his duty who is perplexed with difficulties? *Barrow.*

The more any man's soul is cleansed from sensual lusts, the more nimble and *expedite* it will be in its operations. *Tillotson.*

Nature left his ears naked, that he may turn them more *expeditely* for the reception of sounds from every quarter. *Grew.*

An inquisition would still be a further improvement, and would *expedite* the conversion of the Papists. *Swift.*

EXPEL', *v. a.*
EXPEL'LER, *n. s.*
Lat. *expello*, *expellere*, i.e. *extra pellere* (Minsheu). To drive out or away; to eject, refuse, exclude.

The Lord your God shall *expel* them from before you, and drive them from out of your sight. *Jos.* xxiii. 5.

And would you not poor fellowship *expel*,
Myself would offer you t' accompany
In this adventurous chanceful jeopardy. *Hubbard.*

I may know the let why gentle peace
Should not *expel* these inconveniences. *Shakspeare.*

Oh that that earth which kept the world in awe
Would patch a wall, *expel* the winter's flaw! *Id.*

Since she did neglect her looking-glass,
And threw her sun-*expelling* mask away,
The air hath starved the roses in her cheeks,
And pitched the lily tincture of her face. *Id.*

Whatsoever cannot be digested by the stomach, is either put up by vomit, or put down to the guts, and other parts of the body are moved to *expel* by consent. *Bacon's Natural History*

Unspotted faith *expeller* of all vice. *Fanshawe.*

The virgin huntress was not slow
T' *expel* the shaft from her contracted bow. *Dryden.*

Arms and the man I sing, who forced by fate,
And haughty Juno's unrelenting hate,
*Expelled* and exiled left the Trojan shore. *Id.*

Suppose a mighty rock to fall there, it would *expel* the waters out of their places with such violence as to fling them among the clouds. *Burnet.*

EXPEND', *v. a.*
EX'PENCE, or
EXPENSE, *n. s.*
EXPENSE'FUL, *adj.*
EXPENSE'LESS,
EXPEN'SIVE,
EXPEN'SIVELY, *adv.*
EXPEN'SIVENESS, *n. s.*
Ital. *espensa*; Span. *dispensa*; Fr. *depense*; from Lat. *expendo*, *ex* and *pendo*, to weigh. To lay out money, to spend; hence to bestow or give: expense is the better mode of writing the substantive. The meaning of the compounds seems sufficiently clear.

If my death might make this island happy,
I would *expend* it with all willingness. *Shakspeare.*

The king of England wasted the French king's country, and thereby caused him to *expend* such sums of money as exceeded the debt. *Hayward.*

Hence comes that wild and vast *expense*,
That hath enforced Rome's virtue thence,
Which simple poverty first made. *Ben Jonson.*

I'd have you sober and contain yourself,
Not that your sail be bigger than your boat;
But moderate your *expense* now, at first,
As you may keep the same proportion still. *Id.*

A physician may save any army by this frugal and *expenseless* means only. *Milton on Education.*

No part of a structure is either more *expenseful* than windows or more ruinous. *Wotton's Architect.*

A feast prepared with riotous *expense*,
Much cost, more care, and most magnificence.
*Dryden.*

Frugal and industrious men are friendly to the established government, as the idle and *expensive* are dangerous. *Temple.*

This requires an active, *expensive*, indefatigable goodness, such as our apostle calls a work and labour of love. *Sprat.*

We are apt to rely upon future prospects, and become really *expensive* while we are only rich in possibility. *Addison.*

What health promotes, and gives unenvyed peace,
Is all *expenseless*, and procured with ease.
*Blackmore.*

Such provision made, that a country should not want so many springs as were convenient, and afford a supply every where suitable to the necessities and *expenses* of each climate. *Woodward.*

The publick burthens, though they may be a good reason for our not *expending* so much in charity, yet will not justify us in giving nothing. *Atterbury.*

Their highways, for their extent, solidity or *expensiveness*, are some of the greatest monuments of the grandeur of the Roman empire. *Arbuthnot.*

I never knew him live so great and *expensively* as he hath done since his return from exile. *Swift.*

I can see no reason by which we are obliged to make those prodigious *expenses*. *Id.*

Fancy, and pride, seek things at vast *expense*,
Which relish not to reason, nor to sense. *Young.*

I applied very assiduously to my work: but I *expended* with Ralph almost all that I earned.
*Franklin.*

Superstition never prevailed among any people but at the *expense* of morals. *Robertson's Sermons.*

A fine piece of ruins, built by the late lord Holland, at a great *expense*, which the day after I saw it tumbled down for nothing.
*Cowper. Private Correspondence.*

They cease to have their faculties excited into their usual activity, and become unhappy, I suppose from the too great accumulation of the sensorial power of volition; which wants the accustomed stimulus or motive to cause its *expenditure*. *Darwin.*

EXPE'RIENCE, *n. s.* & *v. a.*
EXPE'RIENCED, *part. adj.*
EXPE'RIENCER,
EXPE'RIMENT, *n. s.*, *v. a.* & *v. n.*
EXPERIMEN'TAL, *adj.*
EXPERIMEN'TALLY, *adv.*
EXPER'IMENTER, *n. s.*
EXPERT', *adj.*
EXPERT'LY, *adv.*
EXPERT'NESS, *n. s.*

Fr. *experience*; Ital. *experienza*, *esperimento*; Spanish and Port. *experiencia*, *esperimento*; Lat. *experientia*, *experimentum*, *ex*, expletive, and *pario*, to produce, or invent. Practise; trial; skill or wisdom resulting from practise: an experiencer and experimenter, alike mean one who makes trial or experiments. Experiment is essay: trial; an operation upon matter or things partially known to ascertain something unknown: the verb signifies to try or test; to endeavour to ascertain qualities or things unknown: as a neuter verb to make trial. Expert is wise or skilful by experience.

And men may well preven be *experience* and sotyle compassement of wytt, that zif a man fond passages be schippes, that wolde go to serchen the world, men myghte go be schippee alle aboute the world, and aboven and benethen. *Sir John Mandeville.*

Old Timon, who in youthly yeares hath beene
In warlike feates the *expertest* man alive,
And is the wisest now on earth I weene.
*Spenser. Faerie Queene.*

That which sheweth them to be wise, is the gathering of principles out of their own particular *experiments*; and the framing of our particular *experiments*, according to the rule of their principles, shall make us such as they are. *Hooker.*

Now we will take some order in the town,
Placing therein some *expert* officers. *Shakspeare.*

Boys immature in knowledge
Pawn their *experience* to their present pleasure.
*Id.*

Trust not my reading, nor my observations
Which with *experimental* seal do warrant
The tenor of my book. *Id.*

Hereof *experience* hath informed reason, and time hath made those things apparent which were hidden.
*Raleigh.*

A prison is a grave to bury men alive, and a place wherein a man for halfe a yeare's *experience* may learne more law than he can at Westminster for an hundred pound. *Mynshul*, 1618.

It is good, also, not to try *experiments* in states, except the necessity be urgent, or the utility evident.
*Bacon.*

*Expert* men can execute, and judge of particulars, one by one; but the general counsels, and the plots and marshalling of affairs, come best from those that are learned. *Id.*

Is there less hope from your enemies that shall be, when ye go under strong and *expert* leaders, than from the enemies that were, when ye shall return masterless. *Bp. Hall's Contemplations.*

Galileus and Mersennus, two exact *experimenters*, do think they find this verity by their experiences, but surely this is impossible to be done. *Digby.*

A curious *experiencer* did affirm, that the likeness of any object, if strongly enlightened, will appear to another, in the eye of him that looks strongly and steadily upon it, till he be dazzled by it, even after he shall have turned his eyes from it. *Id.*

But apt the mind or fancy is to rove
Unchecked, and of her roving is no end,
'Till warned, or by *experience* taught, she learn,
That not to know at large of things remote
From use, obscure and subtle, but to know
That which before us lies in daily life,
Is the prime wisdom. *Milton.*

He through the armed files
Darts his *experienced* eye. *Id.*

Adam! by sad *experiment* I know,
How little weight with thee my words can find. *Id.*

The *experimental* testimony of Gillius is most considerable of any, who beheld the course thereof.
*Browne's Vulgar Errours.*

The miscarriage being somewhat universal, has made us impart what we have *experimentally* learned by our own observations. *Evelyn's Kalendar*

The meanest sculptor in the Æmilian square,
Can imitate in brass the nails, and hair;
*Expert* in trifles, and a cunning fool,
Able t' express the parts, but not dispose the whole.
*Dryden.*

Such a project it is, which, in my text, by a very trusty voucher and skilful judge of such things, and one who had himself fully *experimented* it, is proposed. *Barrow.*

History teaches this best, next to *experience*; which is the only effectual way to get a knowledge of the world. *Locke.*

We must perfect, as much as we can, our ideas of the distinct species; or learn them from such as are used to that sort of things, and are *experienced* in them. *Locke.*

When the succession of ideas ceases, our perception of duration ceases with it, which every one *experiments* whilst he sleeps soundly. *Id.*

They have not the good luck to be perfectly knowing in the forms of syllogism, or *expert* in mode and figure. *Id.*

Francisco Redi *experimented* that no putrified flesh will of itself, if all insects be carefully kept from it, produce any. *Ray on the Creation.*

'Till his fall man's mind was ignorant of nothing but of sin; or, at least, it rested in the notion without the smart of the *experiment.* *South's Sermons.*

Again fair Alma sits confest,
On Florimel's *experter* breast;
When she the rising sigh constrains,
And by concealing speaks her pains. *Prior.*

We have no other evidence of universal impenetrability, besides a large experience, without an *experimental* exception. *Newton.*

While the man is under the scourge of affliction, he is willing to abjure those sins which he now *experimentally* finds attended with such bitter consequences. *Rogers's Sermons.*

These are so far from being subservient to atheists in their audacious attempts, that they rather afford an *experimental* confirmation of the universal deluge. *Bentley's Sermons.*

But if you'll prosper, mark what I advise,
Whom age and long *experience* render wise. *Pope.*
To him *experienced* Nestor thus rejoined,
O friend! what sorrows dost thou bring to mind! *Id.*

Thy offspring bloom,
*Expert of* arms, and prudent in debate,
The gifts of Heaven to guard thy hoary state. *Id. Odyssey.*

When we are searching out the nature or properties of any being by various methods of trial, this sort of observation is called *experiment.* *Watts.*

Soon as man, *expert* from time, has found
The key of life, it opes the gates of death. *Young.*

A man who enters the theatre is immediately struck with the view of so great a multitude, participating of one common amusement; and *experiences*, from their very aspect, a superior sensibility of disposition of being affected with every sentiment which he shares with his fellow-creatures. *Hume.*

If we see them obedient to the laws, prosperous in their industry, united at home, and respected abroad, we may reasonably presume that their affairs are conducted by men of *experience,* abilities, and virtue. *Junius.*

Young men are as apt to think themselves wise enough, as drunken men are to think themselves sober enough. They look upon spirit to be a much better thing than *experience*, which they call coldness; for though spirit without *experience* is dangerous, *experience* without spirit is languid and defective. *Chesterfield.*

Sleep, when it follows, will be natural and undisturbed. While indolence, with full feeding, occasions night-mares and horrors inexpressible: we fall from precipices, are assaulted by wild beasts, murderers, and demons, and *experience* every variety of distress. *Franklin.*

O most delightful hour by man
*Experienced* here below,
The hour that terminates his span,
His folly, and his woe! *Cowper.*

Such rhapsodies our shrewd discerning youth
Learn from *expert* inquirers after truth;
Whose only care, might truth presume to speak,
Is not to find what they profess to seek. *Id.*

An historian may describe from hearsay; a poet must describe from seeing and *experience;* and this he is enabled to do by making use of the eye of imagination. *Beattie.*

Look on her well—does she seem formed to teach?
Should you expect to hear this lady preach?
Is grey *experience* suited to her youth?
Do solemn sentiments become that mouth?
Bid her be grave, those lips should rebel prove
To every theme that slanders mirth or love. *Sheridan.*

EX'PIATE, *v. a.*
EX'PIABLE, *adj.*
EXPIA'TION, *n. s.*
EXPIA'TORY, *adj.*
Fr. *expier;* Lat. *expio*, *ex* and *pio*, to worship (hence to appease a divine power). To make atonement for; to annul guilt; to satisfy, as for injury: to make reparation for: the compounds all follow these senses.

His voluntary death for others prevailed with God, and had the force of an *expiatory* sacrifice. *Hooker.*

Strong and able petty felons, in true penitence, implore permission to *expiate* their crimes by their assiduous labours in so innocent and so hopeful a work. *Bacon's Physical Remains.*

Upon the birth of such monsters, the Grecians and Romans did use divers sorts of *expiations*, and to go about their principal cities with many solemn ceremonies and sacrifices. *Hayward.*

The odium which some men's rigour or remissness had contracted upon my government, I resolved to *expiate* by regulations. *King Charles.*

The treasurer obliged himself to *expiate* the injury, to procure some declaration to that purpose, under his majesty's sign manual. *Clarendon.*

Law can discover sin, but not remove,
Save by those shadowy *expiations* weak,
The blood of bulls and goats. *Milton.*

The former part of this poem is but a due *expiation* for my not serving my king and country in it. *Dryden.*

Lustrations and processions were much easier than a clean conscience, and a steady course of virtue; and an *expiatory* sacrifice, that atoned for the want of it, was much more convenient than a strict and holy life. *Locke.*

For the cure of this disease an humble, serious, hearty repentance is the only physick; not to *expiate* the guilt of it, but to qualify us to partake of the benefit of Christ's atonement. *Ray.*

Let a man's innocence be what it will, let his virtues rise to the highest pitch of perfection, there will be still in him so many secret sins, so many human frailties, so many offences of ignorance, passion, and prejudice, so many unguarded words and thoughts, that without the advantage of such an *expiation* and atonement as Christianity has revealed to us, it is impossible he should be saved. *Addison.*

The more they have hitherto embezzled their parts, the more they endeavour to *expiate* that unthriftiness by a more careful managery for the future. *Government of the Tongue.*

Confessing that in the sight of God, the just Judge of things, the blood of the offerers should be shed, and their bodies burnt for their sins—but that through the mercy of God, *expiation* was made for them by the victims being put in their place, by whose blood and life the blood and life of the offerers were redeemed. *Abarbanel. Theol. Rev.*

Since we have no longer a emple or altar, there remains no *expiation* for sins, but repentance only—and this will *expiate* all transgressions.
*Maimonides. Id.*

When they (the Jews) themselves die, they pray that their own deaths may be considered as an *expiation* or satisfaction for their sins. *Dr. Priestley.*

In that humiliating attitude, in spite of my protests, he may supplicate pardon for his menacing proclamations; and, as an *expiation* to those whom he failed to terrify with his threats, he may abandon those whom he had seduced by his promises. *Burke.*

EXPILLI (Claude), a native of Voiron in the province of Dauphiny, born 1561, was eminent in French jurisprudence. He was educated at Turin, Padua, and the university of Bourges, where he graduated. Besides his Pleadings, printed at Paris in 1612, 4to., and other professional works, he was the author of a treatise on Orthography, Lyons, folio, 1618, and of a volume of poems in the French language, Grenoble, 1624. He died president of the parliament of Grenoble in 1636.

EXPILLI (John Joseph), a French ecclesiastic, was born in 1719, at St. Remy. He was a learned and ingenious geographer, correcting from personal observation various errors in the relative situations of different places in Europe and Africa. He published several scientific works, the principal of which are, Polychorographie, 8vo; De la Population de la France, folio; Dictionnaire geographique des Gaules et de la France, in six folio vols.; Manuel Geographie, 12mo.; Topographie de l'Amiens, 2 vols. 8vo.; Cosmographie, folio; Della casa Milano, 4to.; and a Tour though England, Scotland, and Ireland. His death took place at the beginning of the French Revolution.

EXPIRE', *v. a.* & *v. n.* } Fr. *expirer;* Ital.
EXPIRA'TION, *n. s.* } *espirare;* Span. and Port. *expirar;* Lat. *expirare*, i. e. *extra spirare* (à Gr. σπαιρω) to breathe forth. To breathe out; exhale; hence to close, conclude; and in our old writers, bring to an end: as a neuter verb, to make emission of breath: breathe the last breath; conclude; terminate; die. Dryden poetically uses it for the action of the ball proceeding out of a gun.

To save his body from the scorching fire,
Which he from hellish entrails did *expire.*
*Faerie Queene.*

All thy praise is vain,
Save what this verse, which never shall *expire,*
Shall to thee purchase. *Spenser.*

When as time flying with wings swift,
*Expired* had the term that these two javels
Should render up a reck'ning of their travels.
*Hubb. Tale.*

A month before
This bond *expires*, I do expect return
Of thrice three times the value of this bond.
*Shakspeare.*

The dead man's knell
Is there scarce asked, for whom; and good mens' lives
*Expire* before the flowers in their caps,
Dying or ere they sicken. *Id.*

If till the *expiration* of your month,
You will return and sojourn with my sister,
Dismissing half your train, come then to me.
*Id. King Lear.*

In all *expiration* the motion is outwards, and therefore rather driveth away the voice than draweth it.
*Bacon's Nat. Hist.*

Ye presbyters, do you feed the flock till God shall design you a bishop. Till then, therefore, it was but a delegate power, it could not else have *expired* in the presence of a superiour. *Bp. Taylor.*

Anatomy exhibits the lungs in a continual motion of inspiring and *expiring* air. *Harvey.*

This he did in a fortnight after the *expiration* of the treaty of Uxbridge. *Clarendon.*

If the inspiring and *expiring* organ of any animal be stopt, it suddenly dies. *Walton's Angler.*

To satisfy ourselves of its *expiration* we darkened the room, and in vain endeavoured to discover any spark of fire. *Boyle.*

This chafed the boar; his nostrils flames *expire,*
And his red eyeballs roll with living fire. *Dryden.*

The distance judged for shot of every size,
The linstocks touch, the ponderous ball *expires;*
The vigorous saamen every port-hole plies,
And adds his heart to every gun he fires. *Id.*

The fluid which is thus secreted, and *expired* forth along with the air, goes off in insensible parcels.
*Woodward.*

Of an inflammation of the diaphragm, the symptoms are a violent fever, and a most exquisite pain increases upon inspiration; by which it is distinguished from a pleurisy, in which the greatest pain is in *expiration.* *Arbuthnot on Diet.*

Words of this sort resemble the wind in fury and impetuousness, in transientness and sudden *expiration.* *Decay of Piety.*

For when the fair in all their pride *expire,*
To their first elements the souls retire. *Pope.*

————All to reflourish, fades:
As in a wheel all sinks to reascend:
Emblems of man, who passes, not *expires.* *Young.*

We have heard him breathe the groan of *expiration.* *Rambler.*

When day, *expiring* in the west,
The curtain draws o' nature's rest,
I flee to his arms I lo'e best,
And that's my ain dear Davie. *Burns.*

Burst from each pyramid *expiring* groans,
And darker shadows stretched their lengthened cones,
Day after day their deathful rout they steer,
Lust in the van, and rapine in the rear. *Darwin.*

Yet not on thee the fatal meed—
'Tis I, who caused thy crime should bleed.—
On me then, Dian, vent thine ire,
And let her crime with me *expire.* *Sheridan.*

Fatal passion!
Why dost thou not *expire* at once in hearts
Which thou hast lighted up at once? Zarina!
I must pay dearly for the desolation
Now brought upon thee. *Byron.*

And Kaled, though he spoke not, nor withdrew
From Lara's face his fixed despairing view,
With brow repulsive, and with gesture swift,
Flung back the hand which held the sacred gift,
As if such but disturbed the *expiring* man,
Nor seemed to know his life but then began. *Id.*

EXPLAIN', *v. a.* } Fr. *explaner;* Ital.
EXPLAIN'ABLE, *adj.* } *esplanare;* Span. *ex-*
EXPLAIN'ER, *n. s.* } *planar;* Lat. *explano,*
EXPLANA'TION, } to make plain or
EXPLAN'ATORY, *adj.* } smooth. To expound; illustrate; make clear. Explainable is, capable of being made clear. Explainer, an interpreter; expounder. Explanation, the sense or meaning he gives; or the act of explaining.

It is symbolically *explainable*, and implieth purification and cleanness. *Browne's Vulgar Errours.*

Such is the original design, however we may *explain* it away. *Ayliffe's Parergon.*

You will have variety of commentators to *explain* the difficult passages to you. *Gay.*

Some *explained* the meaning quite away. *Pope.*

No translation ought to be the ground of criticism, because no man ought to be condemned upon another man's *explanation* of his meaning. *Id.*

Before this *explanation* be condemned, and the bill found upon it, some lawyers should fully inform the jury. *Swift.*

Had the printer given me notice, I would have printed the names, and writ *explanatory* notes. *Id.*

A vocabulary of the most usual difficult words might be formed for their use, with *explanations*, and they might daily get a few of those words and *explanations* by heart. *Franklin.*

EX'PLETIVE, *n. s.* Fr. *expletif;* Lat. *expletivum*, *ex* and *pleo*, to fill. Something, the chief or only use of which is to fill up a vacancy: particularly applied to redundant words.

Oft the ear the open vowels tire,
While *expletives* their feeble aid do join. *Pope.*

*Expletives*, whether words or syllables, are made use of purely to supply a vacancy; *do*, before verbs plural, is absolutely such; and future refiners may explode *did* and *does*. *Id.*

These are not only useful *expletives* to matter, but great ornaments of style. *Swift.*

Was man made only to flutter, sing, and expire? A mere *expletive* in the mighty work, the marvellous operations of the Almighty? *Young.*

EX'PLICATE, *v. a.*
EX'PLICABLE, *adj.*
EXPLICA'TION, *n. s.*
EX'PLICATIVE, *adj.*
EX'PLICATOR, *n. s.*
EXPLICA'TORY, *adj.*
EXPLI'CIT, *adj.*
EXPLI'CITLY, *adv.*

Fr. *expliquer*; Ital. *explicare*; Span. *explicar*; Lat. *explico*, *e*, privative, and *plico*, to knit together. To unfold; explain, expand, make clear: explicative is having the tendency to explain; explication, the act or mode of making clear: explicit, unfolded; plain: hence, not obscure or implied.

Many things are needful for *explication*, and many for application unto particular occasions. *Hooker.*

They do not understand that part of Christian philosophy which *explicates* the secret nature of this divine sacrament. *Taylor.*

Although the truths may be elicited and *explicated* by the contemplation of animals, yet they are more clearly evidenced in the contemplation of man. *Hale's Origin of Mankind.*

Many difficulties, scarce *explicable* with any certainty, occur in the fabric of human nature. *Hale.*

No such appearances being otherwise so clearly and cleverly *explicable*, as by assigning the divine hand for their principal cause. *Barrow.*

Hereon therefore are grounded those evangelical commands, *explicatory* of this law as it now standeth in force; that as we have opportunity we should do good unto all men, especially unto them who are of the household of faith, &c. *Id.*

Others conceived it much more fit
T'unmount the tube, and open it,
And, for their private satisfaction,
To re-examine the transaction,
And after *explicate* the rest,
As they should find cause for the best.
*Butler.*

Great variety there is in compound bodies, and little many of them seem to be *explicable*. *Boyle.*

The last verse of his last satyr is not yet sufficiently *explicated*. *Dryden.*

By making an *explicit* consent of every commoner necessary to any one's appropriating to himself any part of what is given in common, children or servants could not cut the meat, which their father or master had provided for them in common, without assigning to every one his peculiar part. *Locke.*

These speculations, when most refined, serve only to shew how impossible it is for us to have a clear and *explicit* notion of that which is infinite. *South's Sermons.*

We must lay aside that lazy and fallacious method of censuring by the lump, and bring things close to *explicit* proof and evidence. *Burnet.*

'Tis the substance of this theory I mainly depend upon: many single *explications* and particularities may be rectified upon further thoughts. *Burnet.*

This querulous humour carries an implicit repugnance to God's disposals; but where it is indulged, it usually is its own expositor, and *explicitly* avows it. *Government of the Tongue.*

They *explicate* the leaves and ripen food
For the silk labourers of the mulberry wood.
*Blackmore.*

Allowances are made in the *explication* of our Saviour's parables, which hold only as to the main scope. *Atterbury.*

If the term which is added to the subject of a complex proposition be either essential or any way necessary to it, then it is called *explicative*; for it only explains the subject; as, every mortal man is a son of Adam. *Watts's Logick.*

They are plainly and *explicitly* published; easily understood; and in fair and legible characters writ in every man's heart. *Mason.*

If, therefore, we make Christianity a mystery, we exclude the greater part of mankind from the knowledge of it; which is directly contrary to the intention of its Author, as is plain from his *explicit* and reiterated declarations. *Beattie.*

EXPLODE'
EXPLO'DER, *n. s.*
EXPLO'SION, *n. s.*
EXPLO'SIVE, *adj.*

Latin, *explodo*, *ex* and *plaudo*, to applaud by clapping or noise. To eject or reject with loud expressions of contempt; to drive off or away. Explosion is therefore the driving or blowing any thing away with violence.

Him old and young
*Exploded*, and had seized with violent hands,
Had not a cloud descending snatched him thence
Unseen amid the throng. *Milton's Paradise Lost.*

Thus was the applause they meant
Turned to *exploding* hiss, triumph to shame,
Cast on themselves from their own mouths.
*Milton.*

Old age *explodes* all but morality. *Roscommon.*

Shall that man pass for a proficient in Christ's school, who would have been *exploded* in the school of Zeno? *South.*

Provided that no word, which a society shall give a sanction to, be antiquated and *exploded*, they may receive whatever new ones they shall find occasion for. *Swift.*

But late the kindled power did *explode*
The massy ball, and the brass tube unload.
*Blackmore.*

There is pretended, that a magnetical globe or terrella, being placed upon its poles, would have a constant rotation; but this is commonly *exploded*, as being against all experience. *Wilkins.*

These minerals constitute in the earth a kind of natural gunpowder, which takes fire; and by the assistance of its *explosive* power, renders the shock greater. *Woodward.*

Those parts which abound with strata of stone, or marble, making the strongest opposition, are the most furiously shattered; an event observable not only in this, but all other *explosions* whatever. *Id.*

In gunpowder, the charcoal and sulphur easily take fire, and set fire to the nitre; and the spirit of the nitre being thereby rarified into vapour, rushes out with *explosion*, after the manner that the vapour of water rushes out of an æolipile: the sulphur also, being volatile, is converted into vapour, and augments the *explosion*. *Newton's Opticks.*

With *explosion* vast,
The thunder raises his tremendous voice.
*Thomson*

Has not the Muse asserted pleasures pure,
Like those above, *exploding* other joys?
*Young.*

They act like the comedians of a fair before a riotous audience; they act amidst the tumultuous cries of a mixed mob of ferocious men and women lost to shame, who, according to their insolent fancies, direct, control, applaud, *explode* them; and sometimes mix and take their seats amongst them; domineering over them with a strange mixture of servile petulance and proud presumptuous authority. *Burke.*

So Savery guided his *explosive* steam
In iron cells to raise the balanced beam;
The giant form its ponderous mass uprears,
Descending nods, and seems to shake the spheres.
*Darwin.*

It may be objected, that if the stars had been projected from a chaos by *explosions*, they must have returned again into it from the known laws of gravitation. *Id.*

Explosion, in natural philosophy, a sudden and violent expansion of an aërial or other elastic fluid, by which it instantly throws off any obstacle, and sometimes with considerable force.

Explosion differs from expansion, in that the latter is a gradual and continued power, acting uniformly for some time; whereas the former is always sudden, and only of momentary duration. The expansions of solid substances do not terminate in violent explosions, on account of their slowness, and the small space through which the metal, or other expanding substance, moves; though their strength may be equally great with that of the most active aërial fluids. Thus we find, that though wedges of wood, when wetted, will cleave solid blocks of stone, they never throw them to any distance, as is the case with gunpowder. On the other hand, it is seldom that the expansion of any elastic fluid bursts a solid substance, without throwing the fragments of it to a considerable distance.

The reasons of the above phenomena are, 1. The immense velocity with which the aërial fluids expand, when affected by a considerable degree of heat; and, 2. Their celerity in acquiring heat and being affected by it, which is much superior to that of solid substances. Thus air, heated as much as iron when brought to a white heat, is expanded to four times its bulk; but the metal will not be expanded the 500th part of the space. In the case of gunpowder, the velocity with which the flame moves, is calculated by Mr. Robins, in his Treatise upon Gunnery, to be no less than 7000 feet in a second, or nearly seventy-nine miles per minute. Hence, the impulse of the fluid is inconceivably great, and the obstacles on which it strikes are hurried off with vast velocity, though much less than that just mentioned; for a cannon bullet, with the greatest charge of powder that can be conveniently given, does not move at a greater rate than 2400 feet per second, or little more than twenty-seven miles per minute. The velocity of the bullet again is promoted by the sudden propagation of the heat through the whole body of air, as soon as it is extricated from the materials of which the gunpowder is made; so that it is enabled to strike all at once, and thus greatly to augment the momentum of the ball. It is evident, that this contributes very much to the force of the explosion, by the different result when powder is wetted or mixed with any substance which prevents it from taking fire all at once. In this case, the force of the explosion is vastly inferior to that of dry powder. Upon these principles, we may conclude, that the force of an explosion depends, 1. On the quantity of elastic fluid to be expanded; 2. On the velocity it acquires by a certain degree of heat; and, 3. On the celerity with which the degree of heat affects the whole of the expansible fluid. These three take place in the greatest perfection where the electric fluid is concerned, as in cases of lightning, earthquakes, and volcanoes.

The expansion of the electric fluid is nothing else than its motion from a centre towards a circumference, for it does not seem capable of any proper expansion by a separation of its parts. Hence, when it begins to expand in this manner, the motion is propagated through it with a velocity far exceeding that of any other fluid whatever. Thus, even when the quantity is excessively small, as when an electric spark is sent through a glass full of water or of oil, the expansion is so violent as to dissipate the glass into innumerable fragments, with great danger to the by-standers. See Electricity. In violent lightning, where the electric fluid collects itself into balls, the strength of the explosion is proportionable to the quantity. Every one has heard of the prodigious effects of lightning when it strikes buildings, trees, or even the most solid rocks; and in some cases, where the quantity of electricity is greater than in any flash of lightning, we hear of still more tremendous consequences ensuing. Dr. Priestley gives an instance of a large fire-ball rolling on the surface of the sea, which, after rising up to the top-mast of a ship of war, burst with such violence that the explosion resembled the discharge of hundreds of cannons fired at once. Great damage was done by it; but there is not the least doubt that most of its force was spent on the air, or carried down to the sea by the mast and iron-work of the ship. Indeed, considering that in all cases a great part of the force of electric explosions is dissipated in this manner, it may justly be doubted, whether they can be measured by any method applicable to the mensuration of other forces. Even in artificial electricity the force is prodigiously great. Dr. Van Marum calculated that of the great battery in Teyler's mu-

seem to be upwards of 900 pounds. In the firing of gunpowder, the condensed air, he says, is at first of the dephlogisticated kind, but is quickly phlogisticated by the combustible matters mixed with the nitre, while the heat produced by the inflammation augments the elasticity of the generated air to four times what it usually is; so that the whole force of the explosion is calculated at 1000 times the pressure of the atmosphere. See GUNNERY. Even in ordinary experiments, the confinement of aërial vapors has often occasioned violent explosions in chemical vessels. In one case too the extrication of fixed air adds excessively to the force of an explosion, viz. in that of pulvis fulminans. This is compounded of sulphur, saltpetre, and salt of tartar. The latter contains much fixed air: and it is probable that the violence of the explosion is occasioned by this air; for the greater quantity of it that the alkaline salt contains, the greater force does it explode with. Fulminating gold emits a quantity of phlogisticated air, to which its explosive power is supposed to be owing; but that of fulminating silver is so extraordinary, that scarcely any force of aerial vapor that can be extricated seems able to produce it.

Next in strength to the aërial vapor are those of aqueous and other liquids. The most remarkable effects of these are observed in steam engines; but there is one particular case from which it has been inferred, that aqueous steam is vastly stronger than the flame of gunpowder. This is when water is thrown upon melted copper: for here the explosion is so strong as almost to exceed imagination; and the most terrible accidents have been known to happen from such a slight cause, as one of the workmen spitting in the surface where copper was melting. To understand the manner in which this is accomplished, we must remember that though the air, in cases of ordinary velocity, makes no great resistance, it is far otherwise where the velocity of the moving body becomes very great. In all cases of explosion also there is in the first instance a vacuum made by the exploding fluid; and consequently the weight of the atmosphere is to be overcome, which amounts to about fifteen pounds on every square inch of surface. Supposing the surface of the exploding fluid, then, on that of melted copper to contain an area of four square inches, it meets with a resistance of sixty pounds from the atmosphere, and consequently communicates an equal pressure to the fluid metal. Even this must of consequence throw it about, unless the same pressure were exactly diffused over every part of the surface: but much more must this effect be increased by the immense velocity with which the fluid moves, and by which the resistance of the atmosphere is augmented in a prodigious degree.

The elastic fluid generated is then confined not only by the fluid metal and sides of the furnace, but by the air itself, which cannot get out of the way; so that the whole resembles a cannon closed at the mouth, and filled with inflamed gunpowder. Hence not only the melted metal, but the furnace itself and the adjacent walls of the building, are hurried off as they would be by the firing of a great quantity of gunpowder in a small space. In explaining this phenomenon, Dr. Black supposes that the mere heat of the metal applied to the aqueous steam produces the explosion; and in proof of this alleges, that copper imbibes a greater quantity of heat during fusion than any other metal. Aqueous steam, however, seems to be too slow for producing such sudden and violent effects. Explosions, it is true, will be occasioned by it, but then it must be continued for a very considerable time: whereas the effects of water thrown upon melted copper are instantaneous. It may now be asked, Why such explosions do not take place with any other metal, iron for instance, when water is thrown upon its surface in fusion? In answer, we must observe, That though water is decomposed by being applied to red hot iron in the form of steam, yet there is a possibility, that when the same element is applied in substance to the fluid metal, no decomposition may ensue. Something like this indeed happens with copper itself; for, notwithstanding the violent effects which take place on the contact of water in substance with the melted metal, no explosion happens though aqueous steam be blown upon its surface. On the contrary, the upper part of the metal is thus cooled, and forms itself into cakes, which are afterwards taken off, and new ones formed in the same manner; neither does aqueous steam affect red-hot copper in the manner that it does iron in the same state. A decisive proof that the explosion is not occasioned by the mere heat of the aqueous steam, may be deduced from the example of melted glass, which produces no explosion though we pour water upon it in that state; and yet the heat of melted glass is undoubtedly equal at least to that of melted copper. It must be observed, however, that, in all cases where a very hot body is thrown upon a small quantity of water in substance, an explosion will follow; but here the water is confined and suddenly rarefied into steam, which cannot get away without throwing off the body which confines it. Examples of this kind frequently occur, where masons, or other mechanics, are employed in fastening cramps of iron into stones; where, if there happens to be a little water in the hole into which the lead is poured, the latter will fly out in such a manner as sometimes to burn them severely. Terrible accidents of this kind have sometimes happened in foundries, when large quantities of melted metal have been poured into wet moulds. In these cases the sudden expansion of the aqueous steam has thrown out the metal with violence; and if any decomposition has taken place at the same time, so as to convert the aqueous into an aërial vapor, the explosion must be still greater. To this last kind of explosion we must refer that which takes place on pouring cold water into boiling or burning oil or tallow. Here the case is much the same whether we pour the oil on the water, or the water on the oil. In the former case the water, which lies at the bottom, is rarefied into steam and explodes; in the latter it sinks down through the oil by its superior specific gravity, and explodes as it passes along. In either case, however, the quantity of aqueous fluid must be but small in proportion to that of the oil; a very great quan-

city would put out the flame, or destroy the heat, in whatever way we applied it.

Another kind of explosion is that which takes place in solid substances, where we can scarcely suppose either aqueous or aërial vapors to be concerned. The most remarkable of these are the volcanic bombs mentioned by Sir William Hamilton in the great eruption of Vesuvius in 1779. They were large pieces of lava which burst in pieces like bombs as they fell to the ground; but he does not inform us whether their bursting was attended with any great violence or not. Indeed, amidst such scenes of horror, and tremendous explosions of the volcano, smaller phenomena of this kind would probably be overlooked. Other examples are the glass drops (see Rupert's Drops); the bursting of electrical globes when put in motion; of other glass vessels spontaneously, and seemingly without cause; and lastly the bursting of large cast metal vessels in the act of cooling. These are all so similar that it is probable they depend on one general cause. They all agree in this respect, that their extreme parts are considerably cooled, while the internal remain very hot. Thus, in the volcanic bombs, the current of air, formed by their swift passage through it in falling, necessarily carries off a great quantity of heat from the parts which are in contact with it, while the rest are scarcely at all cooled. The glass drops are artificially cooled on the outside by dropping them upon water; and, in consequence of this, their explosion is probably more violent in proportion to their bulk than that of the volcanic bombs. Glass vessels only burst spontaneously when they have not been well annealed; and this bad annealing consists only in applying cold too suddenly to the outside. Something like this probably takes place when cast-iron vessels explode; and we are certain it does so with electrical globes, for these last are not apt to burst if they have been well annealed. In all cases, therefore, there is a remarkable contraction of the outward surface by the cold, while the internal parts remain as much expanded as ever.

A very singular kind of explosion is produced by hydrogenous and oxigenous gas, or inflammable and dephlogisticated air, mixed together, and set on fire. This differs from any of those hitherto considered, because there is an absolute condensation rather than an expansion throughout the whole of the operation; and could the airs be made to take fire throughout their whole substance absolutely at the same instant, there would be no explosion, but only a sudden production of heat. From this cause is also derived a very singular phenomenon, taken notice of by Dr. Priestley, in his experiments, recorded in the Philosophical Transactions. Having enclosed several quantities of inflammable and dephlogisticated air in a copper vessel, firing them afterwards by the electric sparks, he found that the force of the explosion was directed more towards one part of the vessel than another; least on that part where the electrical discharge was made, and most upon that which was farthest from it. This inequality was very considerable; insomuch that he could not repeat his experiments any number of times without injuring the vessel in that part which was farthest from the discharge. The reason he gives for this is, that the mixture was not fired at the same instant, but first at the place where the discharge was made. This first explosion would have acted equally upon all parts of the vessel, had it not been for the intervention of the air. By the first momentary explosion, however, the air in the farthest part of the vessel was condensed, so that the next explosion was made stronger, while the copper in the fore part of the vessel had the whole of this strong explosion to resist, the hinder part being but little concerned, as the air in it was condensed, and reduced almost to a vacuum.

The effects of explosions, when violent, are felt at a considerable distance, by reason of the concussions they give to the atmosphere; for all of them act upon the atmospherical fluid with the very same force they exert upon terrestrial substances. Sir W. Hamilton relates, that at the explosions of Vesuvius, in 1766, the doors and windows of the houses of Naples flew open, if unbolted, and one door was burst open, though it had been locked. A great quantity of gunpowder being put into the ditch of a fortified city, and set on fire, destroyed part of the wall, and broke down one of the gates. The blowing up of powder-magazines, or powder-mills, will destroy buildings, and kill people, though beyond the reach of the flame, and untouched by any part of the shattered magazine or mill. But the most curious effect is, that they electrify the air, and even glass windows, at a considerable distance. This is always observed in firing the guns of the Tower at London; and some years ago, after an explosion of some powder-mills, a great number of people were alarmed by a rattling and breaking of their china-ware; which undoubtedly was owing to some commotion in the electrical fluid from the violent concussion of the atmosphere. In this respect, however, the effects of electrical explosions themselves are most remarkable, though not in the uncommon way just mentioned; but it is certain that the influence of a flash of lightning is diffused a great way round the place where the explosion happens, producing many very perceptible changes both on the animal and vegetable creation; and, though explosions are sometimes very destructive, they are likewise of considerable use in life, by removing obstacles which could scarcely be overcome by any mechanical power whatever. The principal of these are the blowing up of rocks, the separating of stones in quarries, and other purposes of that kind. For the production of artificial explosions, gunpowder is the only substance that has yet been found to answer; though several attempts have been made to find out a cheap substitute for it. One of the most remarkable of these was by mixing small quantities of water enclosed in little bladders, or some easily destructible vehicles, along with a charge of powder. By this contrivance it was hoped, that the water being converted into vapor when the powder was inflamed, would augment the force of the explosion; but instead of this it was found greatly to diminish it. The reason was, that the conversion of the water into steam required so much of the latent heat of the inflamed gunpowder, that enough was not left to

give the necessary expansion to the aërial fluid produced. A mixture of inflammable and dephlogisticated air has also been tried, but the explosion here has always been found too weak. In mines, indeed, very terrible effects are produced by such a mixture, but in these the quantity is immense; so that the comparative weakness of the mixture cannot be discovered.

EXPLOIT', *n. s.* & *v. a.* Fr. *exploit;* Lat. *explletum*, a thing accomplished. An achievement; something perfectly done, and with real or supposed skill. Camden supplies the only instance of the verb which we have seen.

Knowest thou not any whom corrupting gold
Would tempt into a close *exploit* of death?
*Shakspeare.*

He *exploited* great matters in his own person in Gallia, and by his son in Spain. *Camden.*

How shall I relate
To human sense the' invisible *exploits*
Of warring spirits? *Milton's Paradise Lost.*

He breaks fierce Hannibal's insulting heats;
Of which *exploit* thus our friend Ennius treats.
*Denham.*

Will you thus dishonour
Your past *exploits*, and sully all your wars?
*Addison.*

The more warlike any people were, the more independent they became; and the same persons being both soldiers and subjects, civil privileges and immunities were the consequence of their victories, and the reward of their military *exploits*.
*Robertson's History of Scotland.*

Tho' *exploit* of strength, dexterity, or speed,
To him nor vanity nor joy could bring. *Beattie.*

EXPLORE', or
EXPLO'RATE, *v. a.*
EXPLORA'TION, *n. s.*
EXPLORA'TOR,
EXPLOR'ATORY, *adj.*
EXPLORE'MENT, *n. s.*
Fr. *explorer;* Lat. *exploro*, *ex* and *ploro* (old Latin), to enquire acutely or diligently. To search; examine; investigate; penetrate.

Abdiel that sight endured not, where he stood
Among the mightiest, bent on highest deeds,
And thus his own undaunted heart *explores*. *Milton.*

Snails extrude their horns, and therewith *explorate* their way. *Browne's Vulgar Errours.*

For exact *exploration*, scales should be suspended where the air is quiet, that, clear of impediments, they may the more freely convert upon their natural verticity. *Id.*

Divers opinions I have been inclined to question, not only as a naturalist, but as a chymist, whether they be agreeable to true grounds of philosophy, or the *exploring* experiments of the fire. *Boyle.*

Use may be made of the like way of *exploration* in that enquiry which puzzles so many modern naturalists.
*Id.*

But Capys, and the rest of sounder mind,
The fatal present to the flames designed,
Or to the watery deep; at least to bore
The hollow sides, and hidden frauds *explore*.
*Dryden's Æneid.*

The frustrated search of Porta, upon the *explorement* of many, could scarce find one. *Browne.*

The mighty Stagyrite first left the shore,
Spread all his sails, and durst the deeps *explore*;
He steered securely, and discovered far,
Led by the light of the Mæonian star. *Pope.*

Like what we find in microscopical observations on natural objects: the better the glasses, and the nearer the scrutiny, the more wonders we *explore*. *Mason.*

She tells me too, that duly every morn
Thou climb'st the mountain top, with eager eye
*Exploring* far and wide the watery waste,
For sight of ship from England. *Cowper.*

On trembling wings let youthful fancy soar,
Nor always hunt the sunny realms of joy,
But now and then the shades of life *explore*.
*Beattie.*

The good *explore*,
For peace, those realms where guilt can never soar;
The proud—the wayward—who have fixed below
Their joy—and find this earth enough for woe,
Lose in that one their all—perchance a mite—
But who in patience parts with all delight? *Byron.*

EXPONENT OF A POWER, in arithmetic and algebra, the number which shows how often a given power is to be divided by its root before it be brought down to unity. The exponent of a square number or quantity is 2; of a cube 3; and so on. Exponents are also now used to denote roots, and, like those of the powers, are set above, and somewhat to the right hand of the numbers to which they belong: thus the square, cube, and fourth root of $x$, are denoted by $x^{\frac{1}{2}}, x^{\frac{1}{3}}, x^{\frac{1}{4}}$.

EXPONENTIAL CALCULUS. See CALCULUS.

EXPONENTIAL CURVE is that whose nature is defined or expressed by an exponential equation; as the curve denoted by $a^x = y$, or by $x^x = y$.

EXPONENTIAL EQUATION is one in which is contained an exponential quantity: as the equation $a^x = b$, or $x^x = ab$, &c.

EXPONENTIAL QUANTITY is that whose power is a variable quantity: as the expression $a^y$, or $x$. See FLUXIONS.

EX'PORT, *v. a.* & *n. s.*
EXPORTA'TION, *n. s.*
EXPORT'ER.
Fr. *exporter;* Lat. *exporto*, from *ex* and *porto* (a Gr. φορτιζω), to bear. To carry; and hence to send from a country: as a substantive, the commodity sent out: the exporter is he who sends goods out of a country: exportation, the act or practice of carrying or sending them out.

Glorious followers taint business for want of secrecy, and *export* honour from a man, and make him a return in envy. *Bacon.*

Money will be melted down or carried away in coin by the *exporter*, whether the pieces of each species be by the law bigger or less. *Locke.*

Edward III., by his encouragement of trade, turned the scale so much in favour of English merchandise, that, by a balance of trade taken in his time, the *exported* commodities amounted to two hundred ninety-four thousand pounds, and the imported but to thirty-eight thousand. *Addison's Freeholder.*

Great ships brought from the Indies precious wood, and *exported* pearls and robes. *Arbuthnot.*

The cause of a kingdom's thriving is fruitfulness of soil to produce necessaries, not only sufficient for the inhabitants, but for *exportation* into other countries.
*Swift.*

Hast thou, though suckled at fair Freedom's breast,
*Exported* slavery to the conquered East. *Cowper.*

EXPOSE', *v. a.*
EXPOSI'TION, *n. s.*
EXPOS'ITOR,
EXPOS'ITORY, *adj.*
EXPO'SURE.
Fr. *exposer;* Ital. *espone, esponere;* Span. *exponer;* Lat. *expono, expositum, ex,* forth, and *pono*, to place or lay. To lay out or open; to make bare; to cast out; hence to make liable, or put in danger: exposition is openness of situa-

tion; explanation; interpretation: expositor, he who expounds or explains: expositive, explanatory: exposure, the state of being laid open, or being liable to danger or censure; sometimes synonymous with exposition.

A mirth-moving jest,
Which his fair tongue, conceit's *expositor*,
Delivers in such apt and gracious words,
That aged ears play truant at his tales.
*Shakspeare.*

Ajax sets Thersites
To match us in comparisons with dirt;
To weaken and discredit our *exposure*,
How hard soever rounded in with danger. *Id.*

Take physick, Pomp;
*Expose* thyself to feel what wretches feel,
That thou mayest shake the superflux to them,
And shew Heaven just. *Id. King Lear.*

You are a worthy judge;
You know the law: your *exposition*
Hath been most sound.
*Id. Merchant of Venice.*

When we have our naked frailties hid
That suffer in *exposure*, let us meet. *Id. Macbeth.*

Christian modesty teaches a wise man not to *expose* himself to the fairest show, and to live at the utmost pitch of his strength. *Bp. Hall's Contemplations.*

The *exposing* himself notoriously did change the fortune of the day, when his troops began to give ground. *Clarendon.*

Who here
Will envy whom the highest place *exposes*
Foremost to stand against the Thundrer's aim?
*Milton.*

Moral and political aphorisms are seldom couched in such terms, that they should be taken as they sound precisely, or according to the widest extent of signification; but do commonly need *exposition* and exception. *Barrow.*

In the picture of Abraham's sacrificing his son, Isaac is described as a little boy, which is not consentaneous unto the authority of *expositors*. *Browne.*

But still he held his purpose to depart;
For as he loved her equal to his life,
He would not to the seas *expose* his wife. *Dryden.*

I have sometimes very boldly made such *expositions* of my authors, as no commentator will forgive me. *Id.*

Like Horace, you only *expose* the follies of men, without arraigning their vices.
*Id. Juvenal. Dedication.*

Those who seek truth only, freely *expose* their principles to the test, and are pleased to have them examined. *Locke.*

A father, unnaturally careless of his child, gives him to another man, and he again *exposes* him: a third man finding him, breeds up and provides for him as his own. *Id.*

Scholiasts, those copious *expositors* of places, pour out a vain overflow of learning on passages plain and easy. *Id.*

The sinner's conscience is the best *expositor* of the mind of God, under any judgment or affliction.
*South's Sermons.*

He that wants good sense is unhappy in having learning, for he has thereby only more ways of *exposing* himself. *Tatler.*

Tully has justly *exposed* a precept, that a man should live with his friend in such a manner that if he became his enemy, it should not be in his power to hurt him. *Addison's Spectator.*

A little wit is equally capable of *exposing* a beauty, and of aggravating a fault. *Id.*

To pass the riper period of his age,
Acting his part upon a crowded stage,
To lasting toils *exposed*, and endless cares,
To open dangers, and to secret snares. *Prior.*

Water he chuses, clear, light, without taste or smell; drawn from springs with an easterly *exposition*.
*Arbuthnot.*

A fool might once himself alone *expose*;
Now one in verse makes many more in prose.
*Pope.*

Your fame and your property suffer alike, you are at once *exposed* and plundered. *Id.*

This book may serve as a glossary, or *expository* index, to the poetical writers. *Johnson.*

EXPOSING OF CHILDREN, a barbarous custom practised by most ancient nations, excepting the Thebans, who had an express law, whereby it was made capital to expose children, and ordained that such as were not in a condition to educate them, should bring them to the magistrates, to be brought up at the public expense. Among the other Greeks, when a child was born, it was laid on the ground; and, if the father designed to educate his child, he immediately took it up; but if he forbore to do this, the child was carried away and exposed. The Lacedemonians indeed had a different custom: for with them all new-born children were brought before some of the gravest men in their own tribe, by whom the infants were carefully viewed; and, if they were found lusty and well-favored, they gave orders for their education, and allotted a certain proportion of land for their maintenance; but, if weakly or deformed, they ordered them to be cast into a deep cavern near Mount Taygetus, thinking it neither for the good of the children themselves, nor for the public interest, that such should be brought up. Many exposed their children, only because they were not in a condition to educate them, having no intention that they should perish. It was the unhappy fate of daughters especially to be thus treated, as requiring more to educate and settle them in the world than sons. The parents frequently tied jewels and rings to the children they exposed, whereby they might afterwards discover them, if Providence should preserve them; as well as to encourage such as found them, to nourish and educate them, if alive; or to give them burial, if dead. The places where it was usual to expose children, were those most frequented, that they might be found, and taken up by compassionate persons, who were able to be at the expense of their education. Thus the Egyptians and Romans chose the banks of rivers; and Greeks the highways.

EXPOSTULATE, *v. n.*, EXPOSTULA'TION, *n. s.*, EXPOSTULA'TOR, EXPOSTULA'TORY, *adj.* } Lat. *expostulo*; *ex*, expletive and *postulo*, to desire or entreat. To argue or debate with another, as distinguished from coming to an open rupture.

More bitterly could I *expostulate*,
Save that for reverence of some alive
I give a sparing limit to my tongue.
*Shakspeare.*

The emperor's ambassador did *expostulate* with the king, that he had broken his league with the emperor.
*Hayward.*

He that *expostulated* with God to have Israel live and prosper, why should he deface the rule of their life, in the keeping whereof they should prosper? *Bp. Hall's Contemplations.*

St. Paul rationally *expostulates* in the priest's behalf. *Barrow.*

It is madness for friendless and unarmed innocence to *expostulate* with invincible power. *L'Estrange.*

This fable is a kind of an *expostulatory* debate between Bounty and Ingratitude. *Id.*

Durst I *expostulate* with Providence, I then might k. *Cotton.*

This makes her bleeding patients to accuse
High Heaven, and these *expostulations* use;
Could Nature then no private woman grace,
Whom we might dare to love with such a face? *Waller.*

*Expostulation* is a private accusation of one friend touching another, supposed not to have dealt singly or considerately in the course of good friendship. *Ayliffe.*

It is likewise with much satisfaction, that I find some of the most outlying parts of the kingdom alarmed upon this occasion, having received letters to *expostulate* with me about it from several of my readers. *Spectator.*

*Expostulations* end well between lovers, b[illegible]ll between friends. *Id.*

The bishop will *expostulate*, and the tenant will have regard to the reasonableness of the demand. *Swift.*

It was an unpardonable omission to proceed so far as I have already done, before I had performed the due discourses, *expostulatory*, supplicatory or deprecatory with my good lords the criticks. *Id.*

EXPOUND', *v. a.* } Lat. *exponere*; *ex*, forth,
EXPOUND'ER, *n. s.* } and *pono*, to place. See EXPOSE. To open; make clear; explain.

He *expounded* unto them in all the Scriptures the things concerning himself. *Luke* xxiv. 27.

We cannot better interpret the meaning of those words than pope Leo himself *expounded* them, whose speech, concerning our Lord's ascension, may serve instead of a marginal gloss. *Hooker.*

This they did partly as faithful witnesses; making a mere relation of what God himself had revealed unto them; and partly as careful *expounders*, teachers, and persuaders thereof. *Id.*

This by Calphurnia's dream is signified.
—And this way you have well *expounded* it. *Shakspeare.*

Those right holy fathers, as in matters of faith they did not make truth, but religiously *expounded* it; so, in matters of ecclesiastical government, they did not create provinces, but ordered the countries which they then had. *Raleigh.*

The best he was,
And faithfullest *expounder* of the laws. *Dryden's Juvenal.*

He *expounded* both his pockets,
And found a watch with rings and lockets. *Hudibras.*

Or heard we that tremendous bray alone,
I could *expound* the melancholy tone;
Should deem it by our old companion made,
The ass; for he, we know, has lately strayed,
And being lost perhaps, and wandering wide,
Might be supposed to clamour for a guide. *Cowper.*

EXPRESS', *v. a.*, *adj.* & *n. s.* } Fr. *exprimer*;
EXPRESS'IBLE, *adj.* } Ital. *esprimere*;
EXPRESS'ION, *n. s.* } Span. and Port.
EXPRESS'IVE, *adj.* } *espremir*; Latin
EXPRESS'IVELY, *adv.* } *exprimere*, *expressus*; *ex* and
EXPRESS'IVENESS, *n. s.* } *premo*, to press.
EXPRESS'LY, *adv.* } To press out;
EXPRESS'NESS, *n. s.* } hence to bring
EXPRESS'URE.
out in representation; to copy; show; make known; utter: as an adjective, express signifies closely resembling; plain; apparent; exactly alike; on purpose: as a substantive, a representation by sculpture; a messenger purposely sent; a message sent; a plain declaration: expressible, is capable of being drawn out by pressure, or capable of being uttered or declared: expression, the act of squeezing out by pressure, or the act or mode of explaining any thing: expressive, having the power of uttering or explaining; emphatic: expressly, in direct terms, as distinguished from implication; particularly: expressness, the power of expression, with which last form of this root expressure is an old synonyme.

Moses and Aaron took these men *expressed* by their names. *Numb.* i. 17.

There is not any positive law of men, whether general or particular, received by formal *express* consent, as in councils; or by secret approbation; but the same may be taken away, if occasion serves. *Hooker.*

Articles of belief, and things which all men must do, to the end they may be saved, are either *expressly* set down in Scripture, or else plainly thereby to be gathered. *Id.*

What a piece of work is man! How noble in reason! how infinite in faculties! in form, and moving how *express* and admirable. *Shakspeare.*

Who dare cross 'em,
Bearing the king's will from his mouth *expressly*? *Id.*

There is a mystery in the soul of state,
Which hath an operation more divine,
Than breath or pen can give *expressure* to. *Id.*

Among the watery juices of fruit are all the fruit out of which drink is *expressed*; as the grape and the apple. *Bacon.*

Those juices that are so fleshy, as they cannot make drink by *expression*, yet may make drink by mixture of water. *Id.*

Art did *express*
A quintessence even from nothingness,
From dull privatives and lean emptiness. *Donne.*

Halters and racks cannot *express* from thee
More than thy deeds: 'tis only judgment waits thee. *Ben Jonson.*

All the gazers on the skies,
Read not in fair heaven's story
*Expresser* truth, or truer glory,
Than they might in her bright eyes. *Id.*

I am content my heart should be discovered to the world, without any of those popular captations which some men use in their speeches and *expresses*. *King Charles.*

The king sent an *express* immediately to the marquis, with all the particular information. *Clarendon.*

Of his presence many a sign
Still following thee, still compassing thee round

With goodness and paternal love, his face
*Express*, and of his steps the track divine.
*Milton.*

Less than half we find *exprest*,
Envy bid conceal the rest. *Id.*

As to the testimonies of the fathers, let them be never so *express* against all sorts of prayers and invocations, they hold only of such a sort of prayer. *Stillingfleet.*

The beginning of the worship of images in these western parts was, by the folly and superstition of the people, *expressly* against the will of their own bishop. *Id.*

There is nothing comparable to the variety of instructive *expressions* by speech, wherewith a man alone is endowed, as with an instrument suitable to the excellency of his soul, for the communication of his thoughts. *Holder on Speech.*

So kids and whelps their sires and dams *express*,
And so the great I measured by the less. *Dryden.*

Adorn a dream *expressing* human form,
The shape of him who suffered in the storm. *Id.*

As if *expresses* from all parts had come,
With fresh alarms threatening the fate of Rome.
*Id. Juvenal.*

In moral ideas we have no sensible marks that resemble them, whereby we can set them down; we have nothing but words to *express* them by. *Locke.*

Where reason or scripture is *express* for any opinion, or action, we may receive it as of divine authority. *Id.*

But ill *expression* sometimes give allay
To noble thoughts, whose flame shall ne'er decay.
*Buckingham.*

Each verse so swells *expressive* of her woes,
And every tear in lines so mournful flows,
We, spite of fame, her fate reversed believe,
O'erlook her crimes, and think she ought to live!
*Tickell.*

The murrain has all the *expressiveness* that words can give; it was here that Virgil strained hard to outdo Lucretius. *Addison.*

No longer shall thy bodice aptly lace,
That air and shape of harmony *express*,
Fine by degrees, and delicately less. *Prior.*

To shed tears, among the ancients, when they should *express* their gratitude to the gods with joy was esteemed a profanation. *Broome.*

The poet, to reconcile Helen to his reader, brings her in as a penitent, condemning her own infidelity in very strong *expressions*. *Id.*

They had not only a memory and tradition of it in general, but even of several particular accidents of it likewise, which they handed downwards to the succeeding ages, with notes of the greatest terror *expressible*. *Woodward's Natural History.*

Each skilful artist shall *express* thy form
In animated gold.
*Smith's Phædra and Hippolitus.*

They who are not induced to believe and live as they ought by those discoveries which God hath made in Scripture, would stand out against any evidence whatsoever; even that of a messenger sent *express* from the other world. *Atterbury.*

This account I *expressly* give of them, when I enter on the argument. *Id.*

The juices of the leaves are obtained by *expression*: from this juice proceeds the taste.
*Arbuthnot.*

All the duties that the best political laws enjoin, as conducive to the quiet and order of social life, are *expressly* commanded by our religion. *Rogers.*

A visible and exemplary obedience to God's laws is the most *expressive* acknowledgment of the majesty and sovereignty of God, and disposes others to glorify him by the same observances. *Id.*

Mr. Philips did *express* himself with much indignation against me one evening. *Pope.*

True wit is nature to advantage drest,
What oft was thought, but ne'er so well *exprest*.
*Id.*

And four fair queens, whose hands sustain a flower,
The *expressive* emblem of their softer power. *Id.*

Upon the first moment I was discovered, the emperor had early notice of it by an *express*.
*Gulliver's Travels.*

I love to feel myself of an *express* and settled judgment and affection in things of the greatest moment.
*More's Div. Dial.*

It is usually said by grammarians, that the use of language is to *express* our wants and desires; but men who know the world hold, and I think with some show of reason, that he who best knows how to keep his necessities private, is the most likely person to have them redressed; and that the true use of speech is not so much to *express* our wants as to conceal them.
*Goldsmith.*

How she caught the contagion, I cannot tell: you medical people talk much of infection from breathing the same air, the touch, &c.; but I never *expressly* said I loved her. *Burns.*

Genteel in figure, easy in address,
Moves without noise, and swift as an *express*,
Reports a message with a pleasing grace,
Expert in all the duties of his place. *Cowper.*

The wildest irregularity appears in its composition: the *expression* is warlike and melancholy, and approaches even to the terrible. *Beattie.*

But in his delicate form, a dream of love,
Shaped by some solitary nymph, whose breast
Longed for a deathless lover from above,
And maddened in that vision, are *exprest*.
*Byron.*

Expression, in painting, a natural and lively representation of the subject, or objects intended to be shown. It consists chiefly in representing the human body and all its parts, in the action suitable to it; in exhibiting, in the face, the several passions proper to the figures, and observing the motions they impress on the external parts. Expression, according to Le Brun, is a lively and natural resemblance of the objects which are represented. In every part of painting it is a necessary component, and no picture can be perfect without it, as by it the true characters of things are described. Expression distinguishes the different natures of bodies, makes the figures appear to have motion, and gives to every thing imitated a degree of reality. It is to be observed in the coloring as well as in the design, and in the representation of landscapes as well as in the general composition of figures. Every substance, whether animate or inanimate, is capable of expression: and the skilful painter exhibits the hardness of one substance, and the softness of another, smoothness or roughness, dryness or moisture, clearness or opaqueness, &c., in characters which it is impossible to mistake. Expression being, therefore, a representation of things according to their character, may be considered either with regard to the subject in general, or to the passions relative to it. With respect to the subject, it is particularly requisite that all and every part of the composition should be so adapted to the general character of the

subjects that they should conspire to impress at the same moment one distinct sentiment or idea. Thus for example, in a picture designed to give the representation of a joyful or peaceful event, every object that is introduced should be of a pleasing or tranquil kind; and if the subject be taken from history, its particular nature and character must be diffused through every part of the work; but, wherever any circumstance occurs which counteracts or diminishes the general sentiment raised by the event represented, the insertion of such circumstance will, proportionably to its magnitude, destroy the general expression of the picture. For the purpose of diversifying and giving variety to the expression, extraneous incidents are sometimes introduced; but they ought to be neither contrary to the truth of the history, nor to the principal design of the subject. Whatever is the general character of the subject, whether serene, joyous, melancholy, grave, solemn, or terrible, the picture should discover that character to the first glance of the spectator. The nativity of our Saviour, his crucifixion, interment, resurrection, and ascension, should each have their distinguishing characteristics, and that as much in the general hue of the picture, the accessory ornaments, back ground, &c., as by the action of the figures. In viewing some of the finest religious subjects of the Italian school, sentiments of awe and devotion have been often experienced to be amongst the first impressions made on the spectator, previous to his examination of the particular actions or countenances of the figures, and therefore evidently produced by the general distribution of the composition, or the general tone of the coloring. In the academic discourses of Sir Joshua Reynolds, the works of Ludovico Caracci are justly celebrated for their powerful effect in the latter respect. But, in the power of distinct, peculiar, and appropriate expression, no one has ever excelled Raphael, and scarcely one has equalled him. In the admirable cartoon by him, of St. Paul preaching at Athens, the expression of the whole work is just and strong. The dignified air of the apostle impresses the spectator with reverence. His action is awful and authoritative without excess or extravagance: it is an action which assures us that he who uses it speaks with a power of conviction. The different sentiments of his audience are exhibited with equal skill and judgment. Some appear angry, some malicious, some attentive, some reasoning within themselves on his doctrine, some disputing their truth, and some convinced. Even the back ground has its meaning; and contributes to the demonstration or expression of that superstition, against which the inspired orator directed his eloquence. Certain minor circumstances frequently contribute to the expression of the general subject; and of these Raphael avails himself as much, if not more, than any other painter. In the cartoon of the apostles healing at the beautiful gate of the temple, the burning lamps have the effect of expressing not only the holy uses, but the magnificence of the building in which they are suspended. The expression of character is much aided by the robes or other habits of the figures, their attendants, their ensigns of authority, crowns, maces, swords; or, in humble life, their various implements of labor, crooks, scythes, &c. Raphael, in the cartoon of the people of Lycaonia about to offer sacrifices to St. Paul and Barnabas, has shown the cause of their offerings by adventitious figures. In the fore-ground, the man who had been healed of lameness by those apostles, is the most eager to express his sense of the miraculous power exercised by them, and the individuality of this character is marked not only by a crutch on the ground under his feet, but by the more singular circumstance of an old man taking up the skirt of his garment, looking on the limb which he may be supposed to have remembered in its former crippled state, and expressing his admiration and devotion. Such also was the much admired artifice of the Greek painter Timanthes, to express the prodigious bulk of a cyclops. Around the sleeping monster he placed several satyrs, supposed to be of the ordinary size of the human form, one of whom was measuring the thumb of the giant with his thyrsus, apparently with great caution, lest he should awake; others were running away, as if frightened; others gazing on him from a distance, not daring to approach him. Another artificial mode of expression, practised by painters, is the use of allegorical figures, representative of certain points of the subject. This art has also been derived from the ancients, who have left abundant examples of it; such as in the bas reliefs of the Antonine column at Rome, where the figure of Jupiter Pulvius is introduced to express the rain which fell when the Roman army was preserved by the prayers of the Theban legion; Raphael, in this manner, has personified the river Jordan in his design of the children of Israel crossing that river, and has represented him as pushing back and restraining the course of the waters with his arm.

EX'PROBRATE, *v. a.* } Lat. *exprobro;* from
EXPROBRA'TION, *n. s.* } *probrum*, deformity.
To charge reproachfully; to upbraid.

To *exprobrate* their stupidity, he induces the providence of storks; now, if the bird had been unknown, the illustration had been obscure, and the *exprobration* not so proper. *Brown.*

The goodness we glory in, is to find out somewhat whereby we may judge others to be ungodly: each other's faults we observe as matter of *exprobration*, not of grief. *Hooker.*

When retaliations of vengeance are ministered, extorting confessions like to that of Adoni-bezek; deserving such *exprobrations* as that of Samuel to Agag. *Barrow.*

No need such boasts, or *exprobrations* false
Of cowardice: the military mound
The British files transcend in evil hour
For their proud foes. *Philips.*

It will be a denial with scorn, with a taunting *exprobration*; and to be miserable without commiseration, is the height of misery. *South's Sermons.*

The Parthians, with *exprobration* of Crassus's thirst after money, poured gold into his mouth after he was dead. *Abbot.*

EXPRO'PRIATE, *v. a.* Lat. *ex* and *proprius.* To make no longer our own; to hold no longer as a property. Not in use.

When you have resigned, or rather consigned, your *expropriated* will to God, and thereby entrusted him

to will for you, all his dispensations towards you are, in effect, the acts of your own will.
*Boyle's Seraphick Love.*

EXPU'GN, *v. a.* } Lat. *expugno.* To
EXPUGNA'TION, *n. s.* } conquer; to take by assault; figuratively, to prevail with: conquest.

The *expugnation* of Vienna he could never accomplish. *Sandys.*

All (the ten lepers) cried together: these ten voices were united in one sound; that their conjoined forces might *expugn* that gracious ear. *Bp. Hall.*

EXPULSE', *v. a.* } Fr. *expulser*; Lat. *expul-*
EXPUL'SION, *n. s.* } *sus*; to drive out; the old
EXPUL'SIVE, *adj.* } antithesis of REPULSE, which see: expulsion is the act of expelling, or the state of being expelled: expulsive, having the power to expel.

For ever should they be *expulsed* from France,
And not have title of an earldom there.
*Shakspeare.*

A wooer,
More hateful than the foul *expulsion* is,
Of thy dear husband. *Id. Cymbeline.*

To what end had the angel been sent to keep the entrance into Paradise, after Adam's *expulsion*, if the universe had been Paradise? *Raleigh's History.*

Suppose a nation where the custom were, that after full age the sons should *expulse* their fathers and mothers out of possessions, and put them to their pensions. *Bacon's Holy War.*

Sole victor from the *expulsion* of his foes,
Messiah his triumphal chariot turned. *Milton.*

Inwardly received, it may be very diuretick, and *expulse* the stone in the kidneys. *Browne.*

Others think it possible so to contrive several pieces of steel and a load-stone, that, by their continual attraction and *expulsion* of one another, they may cause a perpetual revolution of a wheel.
*Wilkins's Dædalus.*

This magnificent temple was not finished till after the *expulsion* of Tarquin. *Stillingfleet.*

Dictys relates, that Peleus was *expulsed* from his kingdom by Acastus. *Broome.*

Coffee-coloured urine proceeds from a mixture of a small quantity of blood with the urine; but often prognosticates a resolution of the obstructing matter, and the *expulsion* of gravel or a stone. *Arbuthnot.*

If the member be dependent, by raising of it up, and placing it equal with, or higher than the rest of the body, the influx may be restrained, and the part strengthened by *expulsive* bandages. *Wiseman.*

EXPUNGE', *v. a.* } Lat. *expungo*, perhaps
EXPUNC'TION, *n. s.* } from *ex* negative, and *pingo*, to paint? *pungo* signifying to prick. To blot out or erase; efface; annihilate: expunction is the act of effacing or blotting out.

Wilt thou not to a broken heart dispense
The balm of mercy, and *expunge* the offence?
*Sandys.*

This work will ask many more officials, to make expurgations and *expunctions*, that the commonwealth of learning be not damnified. *Milton.*

A succession of new and fresh benefits should not (as among some savages the manner is for the young to make away the old) supplant and *expunge* ancient ones, but make them rather more dear and venerable to us. *Barrow.*

The difference of the denarius and drachm having been done in the manuscript, it was needless to *expunge* it. *Arbuthnot.*

Deduct what is but vanity, or dress,
Or learning's luxury, or idleness,
Or tricks to shew the stretch of human brain,
Mere curious pleasure, or ingenious pain;
*Expunge* the whole, or lop the' excrescent parts
Of all, our vices have created arts:
Then see how little the remaining sum,
Which serve the past, and must the times to come.
*Pope.*

Neither do they remember the many alterations, additions, and *expungings* made by great authors in those treatises which they prepare for the publick.
*Swift.*

EXPUR'GE, *v. a.* } Lat. *expurgatio, expur-*
EXPUR'GATE, *v. a.* } *go*; i. e. *ex* expletive,
EXPURGA'TION, *n. s.* } and *purgo* to cleanse;
EXPURGA'TOR, } from *purum ago*, to make
EXPUR'GATORY, *adj.* } pure. To purify; clarify; expunge: an expurgator is one who corrects, by expunging: expurgatory, purifying or cleansing from noxious matter.

The council of Trent, and the Spanish inquisition, ingendering together, brought forth or perfected those catalogues and *expurging* indexes that rake through the entrails of many an old good author. *Milton.*

They may well be allowed an *expurgator*.
*Lord Digby.*

There want *expurgatory* animadversions, whereby we might strike out great numbers of hidden qualities; and having once a conceded list, we might with more safety attempt their reasons. *Browne.*

Wise men know, that arts and learning want *expurgation*; and, if the course of truth be permitted to itself, it cannot escape many errours. *Id.*

All the intestines, but especially the great ones, kidneys and ureters, serve for *expurgation*.
*Wiseman.*

Juan was taught from out the best edition,
*Expurgated* by learned men, who place,
Judiciously from out the school-boy's vision,
The grosser parts; but fearful to deface
Too much their modest bard by this omission,
And pitying sore his mutilated case,
They only add them all in an appendix,
Which saves, in fact, the trouble of an index.
*Byron.*

EX'QUISITE, *adj.* } Fr. *exquis*; Span.
EX'QUISITELY, *adv.* } and Port. *exquisito*;
EX'QUISITENESS, *n. s.* } Ital. *esquisito*; Latin, *exquisitus*, sought after, from the verb *exquiro*, i. e. *ex* emphatic, and *quæro* to seek, from Heb. קרא, he calls. Far-sought; excellent; consummate (whether in a good or bad sense); deeply felt.

His absolute exactness they imitate by tending unto that which is most *exquisite* in every particular.
*Hooker.*

We see more *exquisitely* with one eye shut than with both open; for that the spirits visual unite themselves, and become stronger. *Bacon's Nat. Hist.*

Why should the state be troubled with this needless charge of keeping and maintaining so great a navy in such *exquisite* perfection and readiness? *Raleigh.*

A collection of rare manuscripts, *exquisitely* written in Arabick, and sought in the most remote parts by Erpenius, the most excellent linguist. *Wotton.*

With *exquisite* malice they have mixed the gall and vinegar of falsity and contempt. *King Charles.*

We suppose the superficies of the two glasses should be so exactly flat and smooth, that no air at all can come between them; and experience has informed us, that it is extremely difficult to procure from our ordinary tradesmen either glasses or marbles so much as approaching such an *exquisiteness*. *Boyle.*

The soldier then, in Grecian arts unskilled,
Returning rich with plunder from the field,
If cups of silver or of gold be brought,
With jewels set, and *exquisitely* wrought,
To glorious trappings straight the plate he turned,
And with the glittering spoil his horse adorned.
*Dryden.*

The poetry of operas is generally as *exquisitely* ll as the music is good. *Addison on Italy.*

Adam and Eve, before the fall, were a different species; and none but a poet of the most unbounded invention, and the most *exquisite* judgment, could have fitted their conversation and behaviour to their state of innocence. *Addison.*

The pleasures of sense are probably relished by beasts in a more *exquisite* degree than they are by men; for they taste them sincere and pure, without being distracted in the pursuit, or disquieted in the use of them. *Atterbury's Sermons.*

The scales of the scarf-skin hinder objects from making too painful and *exquisite* an impression on the nerves. *Cheyne.*

From it (marriage) are derived those *exquisite* joys or sorrows, which can embitter all the pleasures, or alleviate all the pains in human life.
*Robertson's Sermons.*

If we all adopted their sentiments to a man, their allies, the savage Indians, could not be more ferocious than they are; they could not murder one more helpless woman or child, or, with more *exquisite* refinements of cruelty, torment one more of their English flesh and and blood than they do already. *Burke.*

And 'twas but justice that the swain
For whom so many sighed in vain,
Should feel how *exquiste* the smart,
That rankles in a lover's heart. *Sheridan.*

The ruling passion, such as marble shows
When *exquisitely* chisseled, still lay there,
But fixed as marble's unchanged aspect throws
O'er the fair Venus, but for ever fair. *Byron.*

EXSIC'CATE, *v. a.* Exsic'cant, *adv.* Exsicca'tion, *n. s.* Exsic'cative, *adj.* Lat. *exsicco*, from *ex* and *siccus*; Heb. חחצ, dry. To dry. Exsiccant and exsiccative are, having the quality or power to dry up.

That which is concreted by *exsiccation*, or expression of humidity, will be resolved by humectation; as earth, dirt, and clay. *Browne.*

If in a dissolution of steel a separation of parts be made by precipitation, or exhalation, the *exsiccated* power ascends not unto the loadstone. *Id.*

Great heats and droughts *exsiccate* and waste the moisture and vegetative nature of the earth.
*Mortimer's Husbandry.*

Some are moderately moist, and require to be treated with medicines of the like nature, such as fleshy parts; others dry in themselves, yet require *exsiccants*, as bones. *Wiseman.*

EXSU'CTION, *n. s.* Lat. *exugo.* The act of sucking out, or draining out, without immediate contact of the power of sucking with the thing sucked.

If you open the valve, and force up the sucker, after this first *exsuction*, you will drive out almost a whole cylinder full of air. *Boyle.*

EXSUDE', *v. a.* Exsuda'tion, *n. s.* Lat. *exudo.* To extil; proceed out of, like perspiration: a sweating out; an extillation; an emission.

They seemed to be made by an *exsudation*, or extillation of some petrifying juices out of the rocky earth. *Derham.*

In the cavern at Colebrook Dale, where the mineral tar *exsudes*, the eyes of the horse, which was drawing a cart from within towards the mouth of it, appeared like two balls of phosphorus, when he was above 100 yards off, and for a long time before any other part of the animal was visible. *Darwin.*

There are many other vegetable *exsudations* used in the various arts of dyeing, varnishing, tanning, lacquering, and which supply the shop of the druggist with medicines and with poisons. *Id.*

EXSUFFLATION, *n. s.* Lat. *ex* and *sufflo.* A blast working underneath.

Of volatility, the most degree is when it will fly away without returning: the next is when it will fly up, but with ease return: the next is when it will fly upwards over the helm, by a kind of *exsufflation*, without vapouring. *Bacon.*

EXSU'FFOLATE, *v. a.* [a word peculiar to Shakspeare]. To whisper; to buzz in the ear: from the Italian verb *suffolar.*

Exchange me for a goat,
When I shall turn the business of my soul
To such *exsuffolate* and blown surmises.
*Shakspeare.*

EXTANT', *adj.* Extan'cy, *n. s.* Lat. *extans*, i. e. *ex*, forth, and *stans*, standing. Standing out, or forth; public: hence modern, outstanding in point of time.

They (the ways of truth) are *extant* in God's word, there written as with a sunbeam, so perspicuously expressed, so frequently inculcated, that, without gross negligence or strange dullness, we cannot but descry them. *Barrow.*

The order of the little *extancies* and consequently that of the little depressions, will be altered likewise
*Boyle on Colours.*

The first of the continued weekly bills of mortality *extant* at the parish clerks' hall, begins the twenty-ninth of December 1603. *Graunt.*

That part of the teeth which is *extant* above the gums is naked, and not invested with that sensible membrane called periosteum, wherewith the other bones are covered. *Ray.*

If a body have part of it *extant*, and part of it immersed in fluid, then so much of the fluid as is equal in bulk to the immersed part shall be equal in gravity to the whole. *Bentley.*

The Library of the Faculty of Advocates at Edinburgh, contains not only a large collection of original papers relating to the affairs of Scotland, but copies of others no less curious, which have been preserved by Sir Robert Cotton, or are *extant* in the public offices in England. *Robertson. Preface to History of England.*

Linnæus, who thinks that all the plants now *extant* arose from the conjunction and reproduction of about sixty different vegetables, from which he constitutes his natural orders. *Darwin.*

EXTASY, *n. s.* Extatic', *adj.* Extat'ical. Now written Ecstasy, which see. Rapturous passion: rapt; absorbed.

She thus resolved that whilst the gods
Were troubled, and amongst themselves at odds
Before they could new counsels reallie,
To set upon them in that *extasie*,
And take what fortune, time, and place, would lend.
*Spenser. Faerie Queene.*

I find in me a great deal of *extatical* love, which continually carries me to do good without myself.
*Boyle.*

In trance *extatic* may thy pangs be drowned,
Bright clouds descend, and angels watch thee round
*Pope.*

**EXTEM'PORAL,**
EXTEM'PORALLY,
EXTEMPORA'NEAN, *adj.*
EXTEMPORA'NEOUS,
EXTEM'PORARY,
EXTEM'PORE, *adv.*
EXTEM'PORINESS, *n. s.*
EXTEM'PORIZE, *v. n.*

Lat. *extemporalis*, from *ex*, out, and *tempus*, *temporis*, time. Without premeditation; prompt; ready: extemporanean, extemporaneous, and extemporary have also this sense. Extempore, and extemporally, mean suddenly; readily; without previous time for meditation: extemporiness is the faculty of speaking, or acting, without premeditation; or the state of being unpremeditated: to extemporise is to speak extempore.

Alcidimus the sophister hath arguments to prove, that voluntary and *extemporal* far excelleth premeditated speech. *Hooker.*

The quick comedians
*Extemporally* will stage us, and present
Our Alexandrian revels.
*Shakspeare. Anthony and Cleopatra.*

You may do it *extempore:* for it is but roaring. *Shakspeare.*

A man of pleasant and popular conversation, of good *extemporal* judgment and discourse, for the satisfying of publick ministers. *Wotton.*

Many foolish things fall from wise men, if they speak in haste or be *extemporal.* *Ben Jonson.*

That men should confer at very distant removes by an *extemporary* intercourse, is another reputed impossibility. *Glanville.*

Hast thou no mark at which to bend thy bow
Or, like a boy, pursuest the carrion crow
With pellets and with stones from tree to tree,
A fruitless toil, and livest *extempore?* *Dryden.*

The *extemporizing* faculty is never more out of its element than in the pulpit; though even here, it is much more excusable in a sermon than in a prayer. *South's Sermons.*

Nothing great ought to be ventured upon without preparation; but, above all, how sottish is it to engage *extempore*, where the concern is eternity. *South.*

I have known a woman branch out into a long *extempore* dissertation upon a petticoat. *Addison.*

This custom was begun by our ancestors out of an ambition of shewing their *extemporary* ability of speaking upon any subject. *More's Divine Dialogues.*

They write in so diminutive a manner, with such frequent interlineations, that they are hardly able to go on without perpetual hesitations, or *extemporary* expletives. *Swift.*

Infected persons fly each public place
And none, or enemies alone, embrace.
To the foul fiend their every passions sold,
They love and hate, *extempore*, for gold. *Young.*

He patronised the Improvisatori,
Nay, could himself *extemporise* some stanzas.
*Byron.*

**EXTEND'**, *v. a.* & *v. n*
EXTEN'DER, *n. s.*
EXTEN'DIBLE, *adj.*
EXTEND'LESSNESS, *n. s.*
EXTEN'SIBILITY,
EXTEN'SIBLE, *adj.*
EXTEN'SIBLENESS, *n. s*
EXTEN'SION,
EXTEN'SIONAL, *adj.*
EXTEN'SIVE,
EXTEN'SIVELY, *adv.*
EXTEN'SIVENESS, *n. s.*
EXTEN'SOR,
EXTENT', *n. s.* & *part. adj.*

Fr. *extendre;* Ital. *estendere;* Span. and Port. *estender;* Lat. *extendere*, *extensus*, from *ex* and *tendo;* Gr. τείνω, to stretch. To spread, or stretch out; elongate; amplify; expand; diffuse; enlarge; and, figuratively, to impart, or communicate. In a legal sense, to seize by course of law, i. e. with a view to obtain the full and extended value: an extender is a person or thing by which any thing is extended or moved; and extensor is the name of that muscle of any limb which performs this office. Extendible and extensible mean capable of expansion or elongation; liable to legal seizure: extendlessness, unlimited extension: extensibility and extensibleness, the quality or capacity of being extended. Extension is the state of being extended, or state of extending: extensional and extensive, drawn out; of great extent; wide; large: extent is used by Spenser as a participial adjective; and as a substantive, it signifies the place or time between certain points of extension or expansion; compass; bulk; size; measure; length; communication; legal seizure.

Let there be none to *extend* mercy unto him. *Psalms.*

My goodness *extendeth* not to thee. *Id.*

Both his hands most filthy feculent,
Above the water were on high *extent*,
And fained to wash themselves incessantly.
*Spenser.*

Seeing it is not set down how far the bounds of his speech concerning dissimilitude reach, who can assure us that it *extendeth* farther than to those things only whe[illegible] the nations were idolatrous? *Hooker.*

An emperour of Rome,
Troubled, confronted thus, and for the *extent*,
Of equal justice used with such contempt.
*Shakspeare.*

If much you note him,
You shall offend him, and *extend* his passion:
Feed and regard him not. *Id. Macbeth.*

Let my officers
Make an *extent* upon his house and land,
And turn him going. *Id. As You Like It.*

The hiccough cometh of fulness of meat, especially in children, which causeth an *extension* of the stomach. *Bacon.*

It is sufferable in any to use what liberty they list in their own manner of writing; but the contracting and *extending* the lines and sense of others would appear a thankless office. *Wotton.*

If I mean to reign,
David's true heir, and his full sceptre sway
To just *extent* over all Israel's sons. *Milton.*

The serpent, subtlest beast of all the field,
Of huge *extent* sometimes. *Id.*

Certain molecular seminales must keep the world from an infinitude and *extendlessness* of excursions every moment into new figures and animals. *Hale.*

The law, that settles all you do,
And marries where you did but woo;
And if it judge upon your side,
Will soon *extend* her for your bride;
And put her person, goods, or lands,
Or which you like best, int' your hands.
*Hudibras.*

All rest satisfied at the postures of moderation, and none endure the extremity of flexure or *extension.* *Browne.*

The eyes of Tobit, carrying in themselves some action of their own, were additionally promoted by that power which can *extend* their natures into production of effects, beyond created efficiencies.
*Id. Vulgar Errours.*

That love is blind, is *extensible* beyond the object of poetry. *Glanville.*

Silver beaters chuse the finest coin, as that which is most *extensive* under the hammer. *Boyle.*

The malleous being fixed to an *extensible* membrane, follows the traction of the muscle, and is drawn inward. *Holder.*

See the figure of his lifeless friend,
And his old sire, his helpless hand *extend.*
*Dryden.*

The bigness of such a church ought to be no greater than that unto which the voice of a preacher of a middling lungs can easily *extend.* *Graunt.*

He much magnifies the capacity of his understanding, who persuades himself that he can *extend* his thoughts farther than God exists, or imagine any expansion where he is not. *Locke.*

By this idea of solidity is the *extension* of body distinguished from the *extension* of space: the *extension* of body being nothing but the cohesion or continuity of solid, separable, moveable parts; and the *extension* of space, the continuity of unsolid, inseparable, and immoveable parts. *Id.*

We take notice of the wonderful dilatibility or *extensiveness* of the throats and gullets of serpents: I myself have taken two entire adult mice out of the stomach of an adder, whose neck was not bigger than my little finger. *Ray on the Creation.*

In what manner they are mixed, so as to give a fibre *extensibility*, who can say? *Grew's Cos. Sacra.*

This foundation of the earth upon the waters, or *extension* of it above the waters, doth agree to the antediluvian earth. *Burnet.*

Discretion has large and *extended* views, and, like a well-formed eye, commands a whole horizon: it is the perfection of reason, and a guide to us in all the duties of life. *Addison.*

As we have reason to admire the excellency of this contrivance, so have we to applaud the *extensiveness* of the benefit. *Government of the Tongue.*

The mind, say they, while you sustain
To hold her station in the brain;
You grant, at least she is *extended*,
Ergo the whole dispute is ended. *Prior.*

Civil people had the flexors of their head very strong; but in the insolent there was a great overbalance of strength in the *extensors* of the neck.
*Arbuthnot and Pope's Mart. Scrib.*

Tubes, recently made of fluids, are easily lengthened; such as have often suffered force, grow rigid, and hardly *extendible.* *Arbuthnot.*

The *extension* made, the *extenders* are to be loosened gently. *Wiseman.*

*Extensors* are muscles so called, which serve to extend any part. *Quincy.*

You run into these *extensional* phantasms, which I look upon as contemptuously, as upon the quick wrigglings up and down of pismires. *More.*

To Helen's bed the gods alone assign
Hermione t' *extend* the regal line.
*Pope's Odyssey.*

Should'ring God's altar a vile image stands,
Belies his features, and *extends* his hands. *Pope.*

All are but parts of one stupendous whole,
Whose body Nature is, and God the soul:
That changed through all, and yet in all the same,
Great in the earth, as in the ethereal frame,
—Lives through all life, *extends* through all *extent*,
Spreads undivided, operates unspent. *Id.*

I would not be understood to recommend to all a pursuit of those sciences, to those *extensive* lengths to which the moderns have advanced them. *Watts.*

An *extensiveness* of understanding and a large memory are of service. *Id. Logick.*

Tis impossible for any to pass a right judgment concerning them, without entering into most of these circumstances, and surveying them *extensively*, and comparing and balancing them all aright. *Watts.*

His descriptions of *extended* scenes and general effects bring before us the whole magnificence of nature, whether pleasing or dreadful. *Johnson.*

—And where yon oak *extends* his dusky shoots
Wide o'er the rill that bubbles from his roots.
*Darwin.*

*Extensive* empires have a tendency to become despotical: for the sovereign must keep a great military force, which makes him, if not strictly limited by law master of the lives and fortunes of his people.
*Beattie.*

'Tis said the lion will turn and flee,
From a maid in the pride of her purity,
And the power on high, that can shield the good
Thus from the tyrant of the wood,
Hath *extended* its mercy to guard me as well
From the hands of the leaguering infidel.
*Byron. Siege of Corinth.*

'Tis the perception of the beautiful,
A fine *extension* of the faculties,
Platonic, universal, wonderful,
Drawn from the stars, and filtered through th skies,
Without which life would be extremely dull.
*Byron.*

Her graceful arms in meekness bending
Across her gently budding breast,
At one kind word those arms *extending*
To clasp the neck of him who blest
His child caressing and carest,
Zuleika came—and Giaffir felt
His purpose half within him melt. *Id.*

EXTEN'UATE, *v. a.* & *adj.* } Fr. *extenuer*
EXTENUA'TION, *n. s.* } Ital. *estenuare*
Lat. *extenuare*, i. e. *ex* and *tenuo*, from *tenuis* slender. To make thin, or rare, as opposed t dense; to diminish; lessen; palliate; degrade The substantive follows all these senses.

When you shall these unlucky deeds relate,
Speak of me, as I am: nothing *extenuate*,
Nor set down ought in malice.
*Shakspeare. Othello.*

To persist
In doing wrong, *extenuates* not wrong,
But makes it much more heavy. *Shakspeare.*

Upon his examination he denied little of tha wherewith he was charged, nor endeavoured much t excuse or *extenuate* his fault; so that, not very wisely thinking to make his offence less by confession, h made it enough for condemnation. *Bacon.*

The race of all things here is to *extenuate* and turn things to be more pneumatical and rare, and not to retrograde from pneumatical to that which is dense.
*Id.*

Righteous are thy decrees on all thy works;
Who can *extenuate* thee? *Milton's Par. Lost.*

Yet hear me, Sampson, not that I endeavour
To lessen or *extenuate* my offence. *Milton.*

So far is evil from being *extenuated* by the multitude of the guilty, that nothing can more aggravate it. *Bp. Hall's Contemplations.*

A third sort of marasmus is an *extenuation* of the body, caused through an immoderate heat and dryness of the parts. *Harvey.*

But fortune there *extenuates* the crime;
What's vice in me, is only mirth in him.
*Dryden.*

His body behind his head becomes broad, from whence it is again *extenuated* all the way to the tail.
*Grew's Museum.*

If it be said that Swift should have checked a pas sion which he never meant to gratify, recourse mus

be had to that *extenuation* which he so much despised, ' men are but men.' *Johnson's Life of Swift.*

EXTE'RIOR, *adj.* & *n. s.* } Fr. *exterieur;*
EXTE'RIORLY, *adv.* } Lat. *exterior*, comparative degree of *exterus*, foreign. Outward; external.

You have slandered nature in my form;
Which, howsoever rude *exteriorly*,
Is yet the cover of a fairer mind,
Than to be butcher of an innocent child. *Shakspeare.*

And what is faith, love, virtue unessayed
Alone, without *exterior* help sustained? *Milton.*

Seraphick and common lovers behold *exterior* beauties, as children and astronomers consider Galileo's optick glasses. *Boyle.*

As to honour and reverence, it is plain, that no *exterior* signification, in ceremonious unveiling or cringing to them, can so demonstrate it, as doth the wishing them well in our hearts, and from thence framing particular addresses to the divine Majesty for their welfare. *Barrow.*

Farther, blacker and merrier, are words which, together with the thing they denominate, imply also something else separate and *exterior* to the existence of that thing. *Locke.*

EXTER'MINE, *v. a.* } Fr. *exterminer;* Lat.
EXTER'MINATE, *v. a.* } *extermino:* i. e. *extra*
EXTERMINA'TION, *n. s.* } *terminum*, beyond a
EXTER'MINATOR. } boundary. To destroy; drive away; root out; abolish.

If you do sorrow at my grief in love,
By giving love, your sorrow and my grief
Were both *extermined*. *Shakspeare. As You Like It.*

The question is, how far an holy war is to be pursued, whether to displanting and *extermination* of people? *Bacon.*

Alexander left Grecian colonies in the Indies; but they were *exterminated* by Sandrocothus. *Arbuthnot on Coins.*

This discovery alone is sufficient, if the vices of men did not captivate their reason, to explode and *exterminate* rank atheism out of the world. *Bentley.*

Unlucky vices, on which the *exterminating* lot happened to fall. *Decay of Piety.*

They did not *exterminate* the ancient inhabitants of the countries they subdued; but, seizing the greater part of their lands, they took their persons under protection. *Robertson's History of Scotland.*

Methinks the gentleman, quoth she,
Opposite in the apple-tree,
By his good will would keep us single
Till yonder heaven and earth shall mingle,
Or (which is likelier to befall)
Till death *exterminate* us all. *Cowper.*

If we escaped not, if Heaven spared not us,
Peeled, scattered, and *exterminated* thus;
If Vice received her retribution due,
When we were visited, what hope for you? *Id.*

Prone on their routed rear the cranes descend;
Their bills bite furious, and their talons rend:
With unrelenting ire they urge the chase,
Sworn to *exterminate* the hated race. *Beattie.*

EXTERN', *adj.* } Fr. *externe;* Lat. *exter-*
EXTER'NAL, } *nus (ab exterus).* Out-
EXTER'NALLY, *adv.* } ward; visible; pertaining to the exterior; extrinsic; not inherent.

When my outward action doth demonstrate
The native act and figure of my heart
In compliment *extern*, 'tis not long after
But I will wear my heart upon my sleeve
For daws to peck at. *Shakspeare. Othello.*

The exterior ministry, *externally* and alone, hath in it nothing excellent, as being destitute of the sanctity that God requires, and it is common to wicked men and good. *Taylor.*

Our inward disposition is the life of our actions; according to that doth the God of spirits judge us, while men censure according to our *external* motions. *Bp. Hall's Contemplations.*

When two bodies are pressed one against another, the rare body not being so able to resist division as the dense, and being not permitted to retire back, by reason of the *extern* violence impelling it, the parts of the rare body must be severed. *Digby.*

We come to be assured that there is such a being, either by an internal impression of the notion of a God upon our minds, or else by such *external* and visible effects as our reason tells us must be attributed to some cause, and which we cannot attribute to any other, but such as we conceive God to be. *Tillotson.*

He that commits only the *external* act of idolatry is as guilty as he that commits the *external* act of theft. *Stillingfleet.*

Sleep, without dreaming, is rest from all these; and dreaming itself is the having of ideas (whilst the outward senses are stopped, so that they receive not outward objects with their usual quickness) in the mind, not suggested by any *external* objects, or known occasion, nor under any choice or conduct of the understanding at all. *Locke.*

Adam was then no less glorious in his *externals:* he had a beautiful body as well as an immortal soul. *South.*

Shells, being exposed loose upon the surface of the earth, to the injuries of weather, to be trod upon by horses and other cattle, and to many other *external* accidents, are, in tract of time, broken to pieces. *Woodward.*

For they can command nothing but what is *external:* but God, who knows and looks at the hearts of all his creatures, will accept of nothing but what comes from thence. *Mason.*

EXTIL', *v. n.* } Lat. *ex* and *stillo*, to
EXTILLA'TION, *n. s.* } drop. To drop or distil from; the act of falling in drops.

They seemed made by an exudation or *extillation* of putrifying juices out of the rocky earth. *Derham's Physico-Theology.*

EXTI'MULATE, *v. a.* } Lat. *extimulo.* To
EXTIMULA'TION, *n. s.* } prick; to incite by stimulation: pungency.

Choler is one excretion whereby nature excludeth another, which, descending into the bowels, *extimulates* and excites them unto expulsion. *Browne.*

The native spirits admit great diversity; as, hot, cold, active, dull, &c., whence proceed most of the virtues of bodies; but the air intermixed is without virtues, and maketh things insipid, and without any *extimulation.* *Bacon's Natural History.*

EXTIN'GUISH, *v. a.* } Lat. *extinguo*, from
EXTINCT', *adj.* } *ex* and *stinguo* (à Gr.
EXTINC'TION, *n. s.* } *στιζω*), to put out
EXTIN'GUISHABLE, *adj.* } light. To quench; put
EXTIN'GUISHER, *n. s.* } out light; suppress;
EXTIN'GUISHMENT. } destroy: extinct is, quenched; put out; defunct.

My days are *extinct.* *Job.*

They are *extinct*, quenched as tow. *Isaiah.*

Divine laws of Christian church polity may not be altered by *extinguishment.* *Hooker.*

Bethink thee on her virtues that surmount,
Her nat'ral graces that *extinguish* art. *Shakspeare*

The immediate cause of death is the resolution or *extinguishment* of the spirits.
*Bacon's Natural History.*

They *extinguish* the love of the people to the young king, by remembering some imperfections of his father.
*Hayward.*

When death's form appears, she feareth not
An utter quenching or *extinguishment*;
She would be glad to meet with such a lot,
That so she might all future ill prevent. *Davies.*

Red-hot needles or wires, extinguished in quicksilver, do yet acquire a verticity according to the laws of position and *extinction*. *Browne's Vulgar Errours.*

The parts are consumed through *extinction* of their native heat, and dissipation of their radical moisture.
*Harvey.*

My fame of chastity, by which the skies
I reacht before, by thee *extinguished* dies.
*Denham.*

Heaping on wood, or too many sticks, or too close together, suppresses, and sometimes quite *extinguishes* a little spark, that would otherwise have grown up to a noble flame. *Sir W. Temple.*

The royal family is all *extinct*,
And she who reigns bestows her crown on me.
*Dryden.*

The soft god of pleasure that warmed our desires,
Has broken his bow, and *extinguished* his fires. *Id.*

Of it a broad *extinguisher* he makes,
And hoods the flames. [illegible]

'Tis better to cover the vital flame with an *extinguisher* of honour, than let it consume till it burns blue, and lies agonizing within the socket. *Collier.*

A censure inflicted à jure continues, though such law be *extinct*, or the lawgiver removed from his office. *Ayliffe.*

The *extinction* of nations, and the desolation of kingdoms, were but the effects of this destructive evil.
*Roger's Sermons.*

If it should ever offer to flame out again, I would use the conicum as an *extinguisher* to smother it.
*More's Divine Dialogues.*

Their purple vengeance bathed in gore retires,
Her weapons blunted, and *extinct* her fires. *Pope.*
Then rose the seed of chaos and of night,
To blot out order and *extinguish* light. *Id.*

The nobility are never likely to be *extinct*, because the greatest part of their titles descend to heirs general. *Swift.*

They lie in dead oblivion, losing half
The fleeting moments of too short a life,
Total *extinction* of the' enlighted soul.
*Thomson.*

Religion should *extinguish* strife,
And make a calm of human life;
But friends that chance to differ
On points which God has left at large,
How freely will they meet and charge!
No combatants are stiffer. *Cowper.*

'Tis strange—of yore its welcome seldom failed,
Nor now, perchance, *extinguished*, only veiled.
*Byron.*

Extinguishment, Lat. extinguo. The extinction or annihilation of a right, estate, &c., by means of its being merged in, or consolidated with, another, generally a greater or more extensive, right or estate. Wherever a right, title, or interest is destroyed, or taken away by the act of God, operation of law, or act of the party, this in many books is called an extinguishment. Co. Litt. 147, b. 1 Ro. Abr. 993. It is of various natures, as applied to various rights; viz. estates, commons, debts, ways, &c.

1. If a man hath a yearly rent out of lands, and afterwards purchases the lands whereout it ariseth, so that he hath as good an estate in the land as in the rent: now both the property and rent are consolidated or united in one possessor; and therefore the rent is said to be extinguished. Also where a person has a lease for years, and afterwards buys the property; this is a consolidation of the property and fruits, and an extinguishment of the lease: but if a man have an estate in the land but for life or years, and hath a higher estate as a fee-simple, in the rent; the rent is not extinguished, but in suspense for a time; for after the term, the rent shall revive. Termes de Ley. Extinguishment of a rent is a destroying of the rent by purchase of the land; for no one can have a rent going out of his own land: though a person must have as high an estate in the land, as in the rent, or the rent will not be extinct. Co. Litt. 147. When a lessor enters tortiously upon the lessee against his consent, the rent is extinguished; 2 Lev. 143. But it has been adjudged, that rent is not extinct by the entry of the lessor, but only suspended; and revives by the lessee's re-entry; Dyer 361. An infant has a rent, and purchases the land out of which it is issuing; by this the rent will be suspended, but not extinct; Bro. Extinguish. A man lessee for years takes a wife, or woman lessee a husband, that hath the reversion after the lease; here the term is not extinguished.

2. By purchasing lands wherein a person hath common appendant, the common is extinguished; Cro. Eliz. 594. A commoner releases his common in one acre, it is an extinguishment of the whole common: Show. Rep. 350. And where a person hath common of vicinage, if he encloses any part of the land, all the common is extinct; 1 Brownl. 174. But if one hath common appendant in a great waste, belonging to his tenant, and the lord improve part of the waste leaving sufficient; if he after make a feoffment to the commoner of the land improved, this will be no extinguishment.

3. If a feme sole debtee take the debtor to husband; or there be two joint obligors in a bond, and the obligee marries one of them; or in case a person is bound to a feme sole and another, and she takes the obligor to husband; in these cases the debt will be extinguished; 8 Rep. 136. And if a debtor makes the debtee his executor, or him and another executors, and they take the executorship upon them; or if the debtee makes his debtor executor, &c., it is an extinguishment of the debt, and it shall never revive; Plowd. 184. 1 Salk. 304. But where a debtee or debtor executor legally refuseth; or he and others being made executors they all refuse, then the debt is revived again. Plowd. 185. It is agreed as a general rule, that a creditor's accepting a higher security than he had before, is an extinguishment of the first debt; as if a creditor by simple contract accepts an obligation, this extinguishes the simple contract debt. So if a man accepts a bond for a legacy, he cannot after sue for his legacy in the spiritual court; for by the deed the legacy is extinct and it is become a mere debt at common law. And if a bond creditor obtain judgment on his bond, or has

judgment acknowledged to him, he cannot afterwards bring an action on the bond, for the debt is extinguished in the judgment; but these cases must be understood where the debtor himself enters into these securities; and therefore if a stranger give bond for a simple contract due by another, this does not extinguish the simple contract debt; but if, upon making the contract, a stranger gives bond for it, or being present promises to give bond for it, and afterwards does so, the debt by simple contract is extinguished, the obligation being made upon, or pursuant to the contract. 2 Leon. 110.

But the accepting a security of an inferior nature is by no means an extinguishment of the first debt; as if a bond be given in satisfaction of a judgment. Also the accepting a security of equal degree is no extinguishment of the first debt; as where an obligee has a second bond given to him; for one deed cannot determine the duty upon another. Cro. Eliz. 304, 716, 727. 1 Brownl. 74.

4. If a man hath a *highway* as appendant, and after purchases the land wherein this way is, the way is extinct. Termes de Ley. Though a way of necessity to market or church, or to arable land, &c., is not extinguished by purchase of ground or unity of possession.

EXTIRP', *v. a.*, EXTIR'PATE, *v. a.*, EXTIRPA'TION, *n. s.* Fr. *extirper*; Lat. *extirpo*, from *ex* out of, and *stirps*, *stirpis*, a root. To root out; to exscind; to destroy: extirpation is the act of rooting out, &c.

> Which to *extirp* he laid him privily
> Down in a darksome lowly place far in.
> *Faerie Queene.*

It is said that popery, for want of utter *extirpation*, hath in some places taken root and flourished again. *Hooker.*

> Nor shall that nation boast it so with us,
> But be *extirped* from our provinces. *Shakspeare.*

It doth notably set forth the consent of all nations and ages, in the approbation of the *extirpating* and debellating of giants, monsters, and foreign tyrants, not only as lawful, but as meritorious even of divine honour; and this, although the deliverer came from the one end of the world unto the other. *Bacon.*

Religion requires the *extirpation* of all those passions and vices which render men unsociable and troublesome to one another. *Tillotson.*

Now that from the practice of religion, and from it alone, such inward content and pleasure do spring; that it *extirpateth* the ground and roots of discontent. *Barrow.*

The rebels were grown so strong, that they made account speedily to *extirpate* the British nation in that kingdom. *Dryden.*

We in vain endeavour to drive the wolf from our own to another's door; the breed ought to be *extirpated* out of the island. *Locke.*

It is not the business of virtue to *extirpate* the affections, but to regulate them. *Addison's Spectator.*

Obstinate against all the endeavours employed by their Divine Lawgiver to repress or *extirpate* it, this superstitious spirit broke out on every occasion. *Robertson's Sermons.*

EXTISPI'CIOUS, *adj.* Lat. *extispicium*, i. e. *exta inspicere*, to inspect the entrails. Augurial; relating to the inspection of entrails in order to prognostication.

Thus hath he deluded many nations unto his augurial and *extispicious* inventions, from casual and uncontrived contingencies, divining events succeeding. *Browne's Vulgar Errours.*

EXTOL', *v. a.*, EXTOL'LER, *n. s.* Fr. (old) *extoller*; Ital. *estollere*; Lat. *extollo*, to lift up. To exalt by praise; magnify; applaud.

> *Extol* him that rideth upon the heavens. *Psalms.*

When a rich man speaketh, every man holdeth his tongue; and look, what he saith they *extol* it to the clouds. *Eccles.* xiii.

> *Extollers* of the pope's supremacy. *Bacon.*

> Heaven and earth shall high *extol*
> Thy praises with the' innumerable sound
> Of hymns and sacred songs, wherewith thy throne
> Encompassed shall resound thee ever blessed.
> *Milton.*

> Many are the sayings of the wise,
> In ancient and in modern books enrolled,
> *Extolling* patience as the truest fortitude. *Id.*

> Let Araby *extol* her happy coast,
> Her cinnamon and sweet amomum boast.
> *Dryden.*

> Cowards *extol* true courage to the skies,
> And fools are still more forward to advise.
> *Congreve.*

Praise never gives us much pleasure unless it concur with our own opinion, and *extol* us for those qualities in which we chiefly excel. *Hume.*

> Pure is the nymph, though liberal of her smiles,
> And chaste, though unconfined, whom I *extol*.
> Not as the prince in Shushan, when he called,
> Vainglorious of her charms, his Vashti forth
> To grace the full pavilion. *Cowper.*

EXTORT' *v. a.*, *v. n.* & *part. adj.*, EXTORT'ER, *n. s.*, EXTOR'TION, EXTOR'TIONER, EXTOR'TIOUS, *adj.* Fr. *extorquer*; Ital. *estorquere*; Sp. *extorcer*, *estorcer*; Lat. *extorquere*, *extortus*, from *ex* and *torqueo*, to twist; distort. To wring, wrest, or draw, by force: hence to obtain by violence or oppression: as a neuter verb to practice oppression. Spenser uses extort as a participial adjective: extorter and extortioner are synonymous: extortious is oppressive; unjust; violent.

Nor thieves, nor covetous, nor drunkards, nor revilers, nor *extortioners*, shall inherit the kingdom of God. 1 *Cor.* vi. 10

> He is, said he, a man of great defence,
> Expert in battell and in deedes of armes,
> And more emboldened by the wicked charmes
> With which his daughter doth him still support,
> Having great lordships got, and goodly farmes,
> Through strong oppression of his power *extort*.
> *Spenser. Faerie Queene.*

To whom they never gave any penny of entertainment, but let them feed upon the countries, and *extort* upon all men where they come. *Spenser.*

> His tail was stretched out in wonderous length,
> That to the house of heavenly gods it raught,
> And with *extorted* power and borrowed strength,
> The ever-burning lamps from thence it brought. *Id.*

> 'Till the injurious Roman did *extort*
> This tribute from us, we were free. *Shakspeare.*

> Are my chests filled up with *extorted* gold? *Id.*

> That goodness
> Of gleaning all the lands wealth into one,
> Into your own hands, cardinal, by *extortion*. *Id.*

Edric, the *extorter*, was deprived by king Canute of the government of Mercia. *Camden's Remains.*

There will be always murderers, and adulterers, *extortioners*, church-robbers, traitors, and other rabblement. *Camden.*

Before they did *extort* and oppress the people only by colour of a lewd custom, they did afterwards use the same extortions by warrant. *Davies on Ireland.*

Oppression and *extortion* did maintain the greatness, and oppression and *extortion* did extinguish the greatness of that house. *Id.*

A succeeding king's just recovery of rights from unjust usurpations and *extortions*, shall never be prejudiced by any act of mine. *King Charles.*

That glory never shall his wrath or might
*Extort* from me, to bow and sue for grace
With suppliant knee, and deify his power. *Milton.*

Some things God allows in judgment; their importunity and distrust *extorted* from God this occasion of their overthrow. *Bp. Hall's Contemplations.*

We do well to curb the *extortious* cruelties of some, the corrupt wresting of justice in others. *Bp. Hall.*

The excellency of God's nature doth justly require honour and reverence to him; his sovereign power may also reasonably *extort* obedience from us. *Barrow.*

Piety removeth *extortion* and cozenage out of trade. *Id.*

An epicure hath some reason, and an *extortioner* is a man of wisdom if compared to him (a swearer), for they enjoy some pleasure, or acquire some gain here, in lieu of their salvation hereafter. *Id.*

I remember well the impious oath,
Hardly *extorted* from my trembling youth. *Rowe.*

My earnest desires, not any doubts of your goodness, but my real concern for your welfare, *extort* this from me. *Wake.*

The covetous *extortioner* is involved in the same sentence. *Decay of Piety.*

The temple and its holy rites profaned
By mummeries he that dwelt in it disdained;
Uplifted hands, that at convenient times,
Could act *extortion* and the worst of crimes. *Cowper.*

—So erst when Jove his oath *extorted* mourned,
And clad in glory to the fair returned. *Darwin.*

EXTORTION, in law, includes the exaction of unlawful usury, winning by unlawful games, and taking more than is due under pretence of right. It is punishable by fine and imprisonment; and by 3 Eliz. I. c. 30. it is enacted, that officers of justice guilty of it shall render to the party treble value. There are also other statutes for punishing extortions of sheriffs, gaolers, clerks, attorneys, solicitors, &c.

EXTRACT, *v. a.* & *n. s.* } Fr. *extraire*;
EXTRACTION, *n. s.* } It. *estrarre*; Span.
EXTRACTOR. } *extraer*; Lat. *extraho*, *extractum*; *ex* and *traho*, to draw. To draw out or select from; the substance or thing drawn out or selected: extraction is the act of drawing out, or separating the parts of a compound, chemically or otherwise; derivation; lineage: extractor the person, or thing, by which an extraction is performed.

Out of the ashes of all plants they *extract* a salt which they use in medicines. *Bacon's Natural History.*

Some books may be read by *extracts* made of them by others, but only in the less important arguments, and the meaner books; else distilled books are like common distilled waters, flashy things. *Bacon's Essays.*

The drawing of one metal or mineral out of another, we call *extracting*. *Id. Physical Remains.*

Although the charge of *extraction* should exceed the worth, at least it will discover nature and possibility. *Bacon.*

I will present a few *extracts* out of authors. *Camden.*

The distillations of waters, *extractions* of oils, and such like experiments were unknown to the ancients. *Hakewill.*

A family of an ancient *extraction*, transported with the Conqueror out of Normandy. *Clarendon.*

I now see
Bone of my bone, flesh of my flesh, myself
Before me: woman is her name, of man
*Extracted*. *Milton's Paradise Lost.*

One whose *extraction*'s from an ancient line,
Gives hope again that well-born men may shine;
The meanest in your nature mild and good,
The noble rest secured in your blood. *Waller.*

In tinctures, if the superfluous spirit of wine be distilled off, it leaves at the bottom that thicker substance, which chemists call the *extract* of the vegetables. *Boyle.*

The apostle gives it a value suitable to its *extract*, branding it with the most ignominious imputation of foolishness. *South.*

These waters were *extracted*, and laid upon the surface of the ground. *Burnet's Theory of the Earth.*

To dip our tongues in gall, to have nothing in our mouth but the *extract* and exhalation of our inward bitterness, is no great sensuality. *Government of the Tongue.*

The pert, the talkative, all such as have no sense of the observation of others, are certainly of foreign *extraction*. *Steele.*

It would not defray the charge and labour of the *extraction*, and must needs be all irretrievably lost. *Woodward's Natural History.*

They
Whom sunny Borneo bears, are stored with streams
Egregious, rum and rice's spirit *extract*. *Philips.*

To see how this case is represented, I have *extracted* out of that pamphlet a few notorious falsehoods. *Swift.*

Spend some hours every day in reading, and making *extracts*, if your memory be weak. *Id.*

O remember thy heavenly *extract*; remember thou art a spirit. *Mason.*

In these discourses several things seemed strained and fanciful; but herein he followed entirely the manner of the earlier Fathers, from whom the greatest part of his divinity is not so much imitated as *extracted*. *Burke.*

EXTRADICTIONARY, *adj.* Lat. *extra* and *dictio*. Not consisting in words but realities.

Of *extradictionary* and real fallacies, Aristotle and logicians make six; but we observe men are commonly deceived by four thereof. *Browne.*

EXTRAJUDI'CIAL, *adj.* } Lat. *extra* and
EXTRAJUDI'CIALLY, *adv.* } *judicium*. Out of the regular course of legal procedure.

The confirmation of an election, though done by a previous citation of all persons concerned, may be said to be done *extrajudicially*, when opposition ensues thereupon. *Ayliffe.*

A declaratory or *extrajudicial* absolution is conferred in foro penitentiali. *Id. Parergon.*

EXTRAMI'SSION, *n. s.* Lat. *extra* and *mitto*. The act of emitting outwards; opposite to intromission.

Aristotle, Alhazen, and others, hold that sight is by reception, and not by *extramission*; by receiving

the rays of the object unto the eye, and not by sending any out. *Browne.*

EXTRAMUNDA'NE, *adj.* Lat. *extra* and *mundus.* Beyond the verge of the material world.

'Tis a philosophy that gives the exactest topography of the *extramundane* spaces. *Glanville's Scepsis.*

Say at what point of space Jehovah dropped
His slackened line, and laid his balance by;
Weighed worlds, and measured infinite no more?
Where rears his terminating pillar high
Its *extramundane* head? *Young.*

EXTRA'NEOUS, *adj.* Lat. *extraneus.* Not belonging to a thing; foreign; of different substance; extrinsic.

Relation is not contained in the real existence of things, but something *extraneous* and superinduced. *Locke.*

When the mind refers any of its ideas to any thing *extraneous* to them, they are then called true or false. *Id.*

Gold, when equally pure, and freed from *extraneous* matter, is absolutely alike in colour, consistence, specific gravity, and all other respects. *Woodward.*

Until you nearly trod on them, and then
You started back in horror to survey
The wondrous hideousness of those small men,
Whose colour was not black, nor white, nor grey,
But an *extraneous* mixture, which no pen
Can trace, although perhaps the pencil may. *Byron.*

EXTRAOR'DINARY, *adj.* & *adv.* }
EXTRAOR'DINARILY, *adv.* } Lat. *extraordinarius*, from *extra* and *ordo, ordinis*, a rank. Out of the common order or method; hence eminent, remarkable; used both in a good and bad sense. The use of extraordinary, as an adverb, is only bad, however.

Evils must be judged inevitable, if there be no apparent ordinary way to avoid them; because where council and advice bear rule of God's *extraordinary* power, without *extraordinary* warrant, we cannot presume. *Hooker.*

In the affairs which were not determinable one way or other by the Scripture, himself gave an *extraordinary* direction and counsel, as oft as they sought it at his hands. *Id.*

Spain had no wars save those which were grown into an ordinary: now they have coupled therewith the *extraordinary* of the Valteline and the Palatinate *Bacon.*

In government it is good to use men of one rank equally; for to countenance some *extraordinarily*, is to make them insolent, and the rest discontent. *Id.*

See what *extraordinary* armies have been transmitted thither, and what ordinary forces maintained there. *Davies.*

It will be better for a man who is doubtful of his pay to take an ordinary silver piece with its due stamp upon it, than an *extraordinary* gilded piece which may perchance contain a baser metal under it. *Herbert.*

Without the sovereign influence of God's *extraordinary* and immediate grace, men do very rarely put off all the trappings of their pride, till they who are about them put on their winding sheet. *Clarendon.*

True wisdom is a thing very *extraordinary.* Happy are they that have it: and next to them, not those many that think they have it, but those few that are sensible of their own defects and imperfections, and know that they have it not. *Tillotson.*

The house was built of fair and strong stone, not affecting so much any *extraordinary* kind of fineness, as an honourable representing of a firm stateliness. *Sidney.*

The Indians worshipped rivers, fountains, rocks, or great stones, and all things which seemed to have something *extraordinary* in them. *Stillingfleet.*

I had rather see some women praised *extraordinarily*, than any of them suffer detraction. *Dryden.*

He quotes me right; and I hope all his quotations, wherein he is so *extraordinarily* copious and elaborate, are so. *Howel.*

The temple of Solomon was a type, and therefore was so *extraordinarily* magnificent; otherwise perhaps a cheaper structure might have been as serviceable. *Wilkins's Mathematical Magick.*

I chuse some few either for the *extraordinariness* of their guilt, or the frequency of their practice. *Government of the Tongue.*

The excellent Mr. Boyle was the person who seems to have been designed by nature to succeed to the labours and inquiries of that *extraordinary* genius I have just mentioned. *Spectator.*

I ran over their cabinet of medals, but don't remember to have met with any things in it that are *extraordinary* rare. *Addison.*

But we should not judge of ourselves by that which is unusual or *extraordinary* with us. *Mason.*

We know nothing, or next to nothing, of the substance or structure of our souls, so cannot account for those seeming caprices in them, that one should be particularly pleased with this thing, or struck with that, which, on minds of a different cast, makes no *extraordinary* impression. *Burns.*

CHARLES S. And there are two brothers of his, William and Walter Blunt, Esqrs. both members of parliament, and noted speechers, and what's very *extraordinary*, I believe, this is the first time they were ever bought or sold. *Sheridan.*

EXTRAPARO'CHIAL, *adj.* Lat. *extra* and *parochia.* Not comprehended within any parish.

EXTRAPROVIN'CIAL, *adj.* Lat. *extra* and *provincia.* Not within the same province; not within the jurisdiction of the same archbishop.

An *extraprovincial* citation is not valid, ultra duas diætas, above two days' journey: nor is a citation valid that contains many conditions manifestly inconvenient. *Ayliffe's Parergon.*

EXTRARE'GULAR, *adj.* Lat. *extra* and *regula.* Not comprehended within a rule.

His providence is *extraregular*, and produces strange things beyond common rules: and he led Israel through a sea, and made a rock pour forth water. *Taylor's Rule of Living Holy.*

EXTRAV'AGANCE, or }
EXTRAV'AGANCY, *n. s.* }
EXTRAV'AGANT, *adj.* & *n. s.* }
EXTRAV'AGANTLY, *adv.* }
EXTRAV'AGATE, *v. n.* }
EXTRAV'AGATION, *n. s.* } Old Fr. *extravagance, extravagant*; Ital. *estravagante*; Span. and Port. *extravagante*; Lat *extravagans, extravagantis, extra* and *vagor, vagari*, to wander. Transgression of due bounds; eccentricity; irregularity: hence excessive expense; waste. Extravagant, as a substantive, means a stroller, one who confines himself to no regular occupation or rule of life. To extravagate is to wander out of limits.

At this warning
The *extravagant* and erring spirit hies
To his confine. *Shakspeare. Hamlet.*

I have troubled you too far with this *extravagance*: shall make no delay to recall myself into the road again. *Hammond.*

For a dance they seemed
Somewhat *extravagant* and wild.
*Milton's Paradise Lost.*

Folly, as it grows in years,
The more *extravagant* appears. *Butler.*

With what hope of success, in his forlorn habit, shall he adventure to check the vicious *extravagances* of a ruffling gallant. *Barrow.*

How many, by the wild fury and *extravagancy* of their own passions, have put their bodies into a combustion, and, by stirring up their rage against others, have armed that fierce humour against themselves. *Tillotson.*

In tragedy, the poet who flourished in the scene, is damned in the ruelle; nay more, is not esteemed a good poet, by those who see and hear his *extravagances* with delight. They are a sort of stately fustian and lofty childishness. Nothing but nature can give a sincere pleasure: where that is not imitated, 'tis grotesque painting; the fine woman ends in a fish's tail. *Dryden.*

I dare not ask for what you would not grant:
But wishes, madam, are *extravagant*;
They are not bounded with things possible;
I may wish more than I presume to tell. *Id.*

Her passion was *extravagantly* new;
But mine is much the madder of the two. *Id.*

The imagination is always restless, and suggests variety of thoughts, and the will, reason being laid aside, is ready for every *extravagant* project. *Locke.*

We pity or laugh at those fatuous *extravagants*. *Glanville.*

There are certain *extravagants* among people of all sizes and professions. *L'Estrange.*

Twenty constitutions of pope John XXII. are called the *extravagants*; for that they being written in no order or method, vagantur extra corpus collectionum canonum. *Ayliffe's Parergon.*

There appears something nobly wild and *extravagant* in great natural geniuses, infinitely more beautiful than turn and polishing. *Addison.*

Ridicule, perhaps, is a better expedient against love than sober advice; and I am of opinion, that Hudibras and Don Quixote may be as effectual to cure the *extravagancies* of this passion, as any one of the philosophers. *Id.*

She was so expensive, that the income of three dukes was not enough to supply her *extravagance*. *Arbuthnot.*

I cannot think it *extravagant* to imagine, that mankind are no less in proportion accountable for the ill use of their dominion over creatures of the lower rank of beings, than for the exercise of tyranny over their own species. *Pope.*

Some are found to praise our author, and others as rashly and *extravagantly* contradict his admirers. *Id.*

He that is *extravagant* will quickly become poor, and poverty will enforce dependence, and invite corruption. *Johnson.*

Laws cannot prevent *extravagance*; and perhaps it is not always an evil to the public. A shilling spent idly by a fool may be picked up by a wiser person, who knows better what to do with it; it is, therefore, not lost. *Franklin.*

I do not justify all the *extravagations* of the mob. *Smollet.*

EXTRAVAGANTES, decretal epistles, published after the Clementines; so called, because at first they were not ranged with the other papal constitutions, but seemed to be detached from the canon law. They continued to be called by the same name when they were afterwards inserted in the body of the canon law. The first extravagantes are those of John XXII. successor of Clement V. The last collection was brought down to 1483, and was called the common extravagantes, notwithstanding that they were likewise incorporated with the rest of the canon law.

EXTRA'VASATED, *adj.* } Lat. *extra* and
EXTRAVASA'TION, *n. s.* } *vasa*, vessels.
Forced out of proper vessels The act of forcing or state of being forced out of vessels.

The viscous matter, which lies like leather upon the *extravasated* blood of pleuritick people, may be dissolved by a due degree of heat. *Arbuthnot on Aliments.*

Aliment, too viscous, obstructing the glands, and by its acrimony corroding the small vessels of the lungs, after a rupture and *extravasation* of blood easily produces an ulcer. *Id.*

EXTRAVASATION, in contusions, fissures, depressions, fractures, and other accidents of the cranium, is when one or more of the blood-vessels, that are distributed in the dura mater, are broke or divided, whereby there is such a discharge of blood as greatly oppresses the brain and disturbs its office; frequently bringing on violent pains, &c.; and at length death itself, unless the patient is timely relieved. See MEDICINE and SURGERY.

EXTRAVE'NATE, *adj.* Lat. *extra* and *vena* a vein. Let out of the veins.

That there is a magnetick way of curing wounds by anointing the weapon; and that the wound is affected in like manner as is the *extravenate* blood by the sympathetick medicine as to matter of fact, is with circumstances of good evidence asserted. *Glanville's Scepsis.*

EXTRAVER'SION, *n. s.* Lat. *extra* and *versio*, a turning. The act of throwing out; the state of being thrown out.

Nor does there intervene heat to afford them any colour to pretend that there is made an *extraversion* of the sulphur, or of any of the two other supposed principles. *Boyle.*

EXTRA'UGHT, *part.* This is an obsolete participle from extract; as distraught from distract. Extracted.

Sham'st thou not, knowing whence thou art *extraught*,
To let thy tongue detect thy base born heart. *Shakspeare.*

EXTREME', *adj.* & *n. s.* } Old Fr. *extreme*
EXTREM'EST, *adj.* } Lat. *extremus*, the
EXTREME'LY, *adv.* } last, final. Cor-
EXTREM'ITY, *n. s.* } rupted, as Dr.
Johnson says, by a superlative termination, 'as it has in itself the superlative signification. Last; greatest; of the highest degree; urgent; rigorous: as a substantive, the last point or resort; the greatest or highest degree; extravagance of conduct: extremity is partly synonymous with extreme as a substantive; but it is applied to the constituent parts of things more commonly; to violence of passion, excess or aggravation of disease; the termination of life

The Lord shall smite thee with a fever, an inflammation, and an *extreme* burning. *Deut.* xxviii. 22.

If thou be *extreme* to mark what is amiss, O Lord, who shall abide it? *Psalms.*

O fayrest virgin! full of heavenly light,
Whose wondrous faith, exceeding earthly race,
Was firmest fixt in myne *extremest* case.
*Spenser. Faerie Queene.*

Why should not the same laws take good effect on that people, being prepared by the sword, and brought under by *extremity?* *Spenser.*

With equal measure she did moderate
The strong *extremities* of their outrage. *Id.*

Cases of necessity being sometime but urgent, sometime *extreme*, the consideration of publick utility is urged equivalent to the easier kind of necessity. *Hooker.*

He that will take away *extreme* heat, by setting the body in *extremity* of cold, shall undoubtedly remove the disease; but together with it the diseased too. *Id.*

If I shew no colour for my *extremity*, let me be your table-sport. *Shakspeare.*

The hairy fool
Stood on the *extremest* verge of the swift brook,
Augmenting it with tears. *Id. As You Like It.*

The true Protestant religion is situated in the golden mean: the enemies unto her are the *extremes* on either hand. *Bacon.*

They thought it the *extremest* of evils, to put themselves at the mercy of those hungry and disorderly people. *Id.*

It is a harder matter to endure in *extreme* want, than to obey a hard commandment.
*Bp. Hall's Contemplations.*

He promised, if they should be besieged, to relieve them before they should be reduced to *extremity.*
*Clarendon.*

Thither by harpy-footed furies haled,
At certain revolutions, all the damned
Are brought; and feel by turns the bitter change
Of fierce *extremes*, *extremes* by change more fierce;
From beds of raging fire to starve in ice
Their soft ethereal warmth, and there to pine
Immoveable, infixed, and frozen round
Periods of time; thence hurried back to fire.
*Milton.*

In its proper colour it is inclining to white, excepting the *extremities* or tops of the wing-feathers, which are black. *Browne.*

Suppose any person for our sake willingly should deprive himself of all his estate, his honour, his ease and pleasure, should expose himself to *extremest* hazards, should we not then be monstrously ungrateful, if we did not most deeply resent such kindness.
*Barrow.*

Farewell, ungrateful and unkind! I go,
Condemned by thee, to those sad shades below:
I go the' *extremest* remedy to prove,
To drink oblivion, and to drench my love.
*Dryden.*

The world is running mad after farce, the *extremity* of bad poetry; or rather the judgment that is fallen upon dramatic writing. *Id.*

I wish peace, and any terms prefer,
Before the last *extremities* of war. *Id.*

The *extremities* of the joints must be seldom hidden, and the *extremities* or end of the feet never.
*Id. Dufresnoy.*

The syllogistical form only shews that, if the intermediate idea agrees with those it is on both sides immediately applied to, then those two remote ones, or, as they are called, *extremes*, do certainly agree.
*Locke.*

Should any one be cruel and uncharitable to that *extremity*, yet this would not prove that propriety gave any authority. *Id.*

She might hear, not far from her, an *extremely* doleful voice; but so suppressed with a kind of whispering note, that she could not conceive the words distinctly. *Sidney.*

Miseno's cape and Bauli last he viewed,
That on the sea's *extremest* borders stood.
*Addison.*

A man of wit may *extremely* affect one for the present, but if he has not discretion, his merit soon vanishes away. *Steele.*

The *extremity* of pain often creates a coldness in the *extremities*; but such a sensation is very consistent with an inflammatory distemper.
*Arbuthnot on Diet.*

They sent fleets out of the Red Sea to the *extremities* of Ethiopia, and imported quantities of precious goods. *Arbuthnot.*

Avoid *extremes*, and shun the faults of such
Who still are pleased too little, or too much.
*Pope.*

Whoever sees a scoundrel in a gown, reeling home at midnight, is apt to be *extremely* comforted in his own vices. *Swift.*

Alas! this day
First gave me birth, and (which is strange to tell)
The fates e'er since, as watching its return,
Have caught it as it flew, and marked it deep
With something great, *extremes* of good or ill.
*Young's Busiris.*

The idea of uniting all parties, of trying all characters, and distributing the offices of state by rotation, was gracious and benevolent to an *extreme*. *Junius.*

At last he had drawn so much of this money, that I was *extremely* alarmed at what might become of me, should he fail to make good the deficiency.
*Franklin.*

An *extreme* rigour is sure to arm every thing against it, and at length to relax into a supine neglect.
*Burke.*

Ideas consist of synchronous motions or configurations of the *extremities* of the organs of sense; these when repeated by sensation, volition, or association, are either simple or complex, as they were first excited by irritation; or have afterwards some parts abstracted from them, or some parts added to them. *Darwin.*

This tendency to insubordination forms no part of the temper or character of the people; the contrary disposition is even carried to an *extreme*. *Sheridan.*

Chained to excess, the slave of each *extreme*.
How woke he from the wildness of that dream?
Alas! he told not—but he did awake
To curse the withered heart that would not break.
*Byron.*

And at this moment, when thousands of misguided but most unfortunate fellow-countrymen are struggling with the *extremes* of hardship and hunger, as your charity began abroad, it should end at home. *Id.*

White as a white sail on a dusky sea,
When half the horizon's clouded and half free,
Fluttering between the dun wave and the sky,
Is hope's last gleam in man's *extremity*. *Id.*

EXTRICATE, *v. a.* } Lat. *extrico*, *ex* and EXTRICA'TION, *n. s.* } *tricæ*, hindrances. To disembarrass; free from hindrances or perplexity.

Crude salt has a taste not properly acid, but such as predominates in brine; and it does not appear that this acid spirit did as such pre-exist in the salt whence it was obtained, so that we may suppose it to have been rather by transmutation than *extrication.*
*Boyle.*

We run into great difficulties about free created agents, which reason cannot well *extricate* itself out of.
*Locke.*

These are reliefs to Nature, as they give her an opportunity of *extricating* herself from her oppressions, and recovering the several tones and springs of her vessels. *Addison.*

In this dilemma, she had recourse to me; and, to *extricate* her from her difficulties, I lent her all the money I could spare. *Franklin.*

EXTRIN'SIC, *adj.* } Fr. *extrinseque*; Lat.
EXTRIN'SICAL, } *extrinsicus*, outward.
EXTRIN'SICALLY, *adv.* } External; relating to the exterior of a thing. Sometimes written extrinsecal.

A body cannot move, unless it be moved by some *extrinsical* agent: absurd it is to think that a body, by a quality in it, can work upon itself. *Digby on Bodies.*

But so much shall suffice for preface, concerning the title and other *extrinsical* adjuncts of the Creed. *Barrow.*

If to suppose the soul a distinct substance from the body, and *extrinsically* advenient, be an error, almost all the world hath been mistaken. *Glanville.*

Outward objects, that are *extrinsical* to the mind; and its own operation, proceeding from powers intrinsical, and proper to itself, which, when reflected on by itself, become also objects of its contemplation, are the original of all knowledge. *Locke.*

Neither is the atom, by any *extrinsical* impulse, diverted from its natural course. *Ray.*

When they cannot shake the main fort, they try if they can possess themselves of the out-works, raise some prejudice against his most *extrinsic* adherents. *Government of the Tongue.*

*Extrinsic* modes are such as arise from something that is not in the subject or substance itself; but it is a manner of being which some substances attain, by reason of something external or foreign to the subject; as, this globe lies within two yards of the wall; this man is beloved or hated. *Watts's Logick.*

EXTRUCT', *v. a.* } Lat. *extruo*, *extructum.*
EXTRUCT'OR, *n. s.* } To build; to form into a structure: a builder or contriver.

Papistry is both affirmative and *extructive* of all wickedness. *Fulke.*

.U'DE, *v. a.* }
EXTRU'SION, *n. s.* } off; to drive off; to push out with violence.

They suppose the channel of the sea formed, and mountains and caverns, by a violent depression of some parts of the earth, and an *extrusion* and elevation of others. *Burnet.*

If in any part of the continent they found the shells, they concluded that the sea had been *extruded* and driven off by the mud. *Woodward.*

EXTU'BERANCE, *n. s.* Lat. *ex* and *tuber*, a swelling. Knobs, or parts protuberant; parts that rise from the rest of the body.

The gouge takes off the irregularities or *extuberances* that lie farthest from the axis of the work. *Moxon's Mechanical Exercises.*

EXU'BERATE, *v. n.* } Latin *exubero*, *ex*
EXU'BERANCE, *n. s.* } and *uber*, fruitful. To
EXU'BERANT, *adj.* } bear abundantly: over-
EXU'BERANTLY, *adv.* } growth; luxuriance.

All the loveliness imparted to the creature is lent it, to give us enlarged conceptions of that vast confluence and immensity that *exuberates* in God. *Boyle's Seraphick Love.*

Such immense power, such unsearchable wisdom, and such *exuberant* goodness, as may justly ravish us to an amazement, rather than a bare admiration. *Id.*

A part of that *exuberant* devotion, with which the whole assembly raised and animated one another catches a reader at the greatest distance of time. *Addison's Freeholder.*

A considerable quantity of the vegetable matter lay at the surface of the antediluvian earth, and rendered it *exuberantly* fruitful. *Woodward.*

Men esteem the overflowing of gall the *exuberance* of zeal, and all the promises of the faithful combatant they confidently appropriate. *Decay of Piety.*

Though he expatiates on the same thoughts in different words, yet in his similies that *exuberance* is avoided. *Garth.*

His similies have been thought too *exuberant*, and full of circumstances. *Pope.*

Another Flora there, of bolder hues,
Plays o'er the fields, and showers with sudden hand
*Exuberant* spring. *Thomson's Spring.*

True charity, a plant divinely nursed,
Fed by the love from which it rose at first,
Thrives against hope, and in the rudest scene;
Storms but enliven its unfading green;
*Exuberant* is the shadow it supplies,
Its fruits on earth, its growth above the skies. *Cowper.*

If prouder branches with *exuberance* rude
Point their green germs, their barren shoots protrude. *Darwin.*

Tasso possesses an *exuberant* and sublime imagination though in *exuberance* it seems, in my opinion, inferior to our Spenser, and in sublimity inferior to Milton. *Beattie.*

EXU'CCOUS, *adj.* Lat. *exsuccus.* Without juice; dry.

This is to be effected not only in the plant yet growing, but in that which is brought *exuccous* and dry unto us. *Browne.*

EXUDE', or, } Lat. *exudo*, *ex*, exple-
EXU'DATE, *v. n.* } tive, and *sudo*, to sweat
EXUDA'TION, *n. s.* } To sweat; issue out in the manner of sweat. Dr. Johnson says this also means, as an active verb, to force, or throw out, as by sweat; but we find no instance of it in this sense.

The gum of trees, shining and clear, is but a straining of the juice of the tree through the wood and bark; and Cornish diamonds, and rock rubies which are yet more resplendent than gums, are the fine *exudations* of stone. *Bacon.*

Some perforation in the part itself, through which the humour included doth *exudate*, may be observed in such as are fresh. *Browne.*

Cuckowspittle, or woodsere, that spumous frothy dew, or *exudation*, or both, is found especially about the joints of lavender and rosemary. *Browne's Vulgar Errours.*

The juices of the flowers are, first, the expressed juice; secondly, a volatile oil, wherein the smell of the plant presides; thirdly, honey, *exuding* from all flowers, the bitter not excepted. *Arbuthnot.*

The tumour sometimes arises by a general *exudation* out of the cutis. *Wiseman's Surgery.*

EXUL'CERATE, *v. a.*, *v. n.*, & *adj.* } Fr.
EXULCERA'TION, *n. s.* } *exulcerer*; Span. *exulcerar*; Lat. *exulcero*, *ex* and *ulcero*, *ulcus* (Gr. ab ἑλκος) a sore. To make sore with ulcers; to afflict with sores, or generally: to become ulcerous.

This *exulceration* of mind made him apt to take all occasions of contradiction. *Hooker.*

Sharp and eager humours will not evaporate; and then they must *exulcerate*, and so may endanger the sovereignty. *Bacon.*

Cantharides, applied to any part of the body, touch the bladder and *exulcerate* it, if they stay on long. *Bacon.*

Thoughts, my tormentors, armed with deadly stings,
Mangle my apprehensive tenderest parts,
Exasperate, *exulcerate*, and raise
Dire inflammation, which no cooling herb
Or medicinal liquor can assuage. *Milton.*

The speech being ill taken, the writing might exasperate that which already was *exulcerate*. *Harrington.*

That the saliva hath a virtue of macerating bodies, appears by the effects in taking away warts, sometimes *exulcerating* the jaws, and rotting the teeth. *Ray on the Creation.*

The stagnating serum, turning acrimonious, *exulcerates* and putrefies the bowels. *Arbuthnot.*

EXULT', *v. a.*, EXULT'ANCE, *n. s.*, EXULT'ANCY, EXULT'ANT, *adj.*, EXULTA'TION, *n. s.* Fr. *exulter*; Lat. *exulto*, *ex* and *salto*, to dance. To triumph; glory; rejoice in a high degree. The compounds follow this meaning.

The whole world did seem to *exult* that it had occasion of pouring out gifts to so blessed a purpose. *Hooker.*

Good effects may grow in each of the people towards other, in them all towards their pastor, and in their pastor towards every of them; between whom there daily and interchangeably pass, in the hearing of God himself, and in the presence of his holy angels, so many heavenly acclamations, *exultations*, provocations, petitions. *Id.*

Who might be your mother,
That you insult, *exult*, and rail, at once
Over the wretched? *Shakspeare. As You Like It.*

That boasting *exultancy* of Campian. *Hammond.*

Devotion inspires men with sentiments of religious gratitude, and swells their hearts with inward transports of joy and *exultation*. *Addison's Freeholder.*

We have great cause of *exultance* and joy, God's service being the most perfect freedom. *Government of the Tongue.*

Gaily the splendid ornaments along
*Exultant* ploughed. *Thomson.*

Poets who have to deal with an audience not yet graduated in the school of the rights of men, and who must apply themselves to the moral constitution of the heart, would not dare to produce such a triumph as a matter of *exultation*. *Burke.*

His hoary head,
Conspicuous many a league, the mariner
Bound homeward, and in hope already there,
Greets with three cheers *exulting*. At his waist
A girdle of half-withered shrubs he shows,
And at his feet the baffled billows die. *Cowper.*

Roll on, thou fair orb, and with gladness pursue
The path that conducts thee to splendour again:
But man's faded glory what change shall renew?
Ah, fool! to *exult* in a glory so vain! *Beattie.*

And must I think it! is she gone,
My secret heart's *exulting* boast?
And does she heedless hear my groan?
And is she ever, ever lost? *Burns.*

A thing of dark imaginings, that shaped
By choice the perils he by chance escaped;
But 'scaped in vain, for in their memory yet
His mind would half *exult*, and half regret. *Byron.*

EXUMA, GREAT and LITTLE, are islands of the West Indies, on the Great Bahama bank. In 1803 they had 140 whites, and 1000 blacks; they have a port of entry, and make much salt. Long Island, or Yuma, at the south-east extremity of the Great Bank, is fifty miles long, but very narrow; in 1803 it had 2500 inhabitants. On the east side is Great Harbour, from whence its salt is exported. There is also a chain of islands called the Exuma Keys, which reach for a considerable extent along one edge of the Great Bahama Bank, generally in a south-west direction. They commence at Ship Channel Key, ten leagues E. S. E. from the east end of the island of New Providence, and extend to Great Exuma, the harbour of which lies fifty leagues from New Providence. The principal island lies between long. 74° 28′ and 74° 48′ W., and between lat. 23° 21′ and 23° 31′ N.

EXUMA SOUND, a channel among the Bahama islands, extending from north-west to south-east, between Cat Island, or Guanahani to the east, and a range of small islands and rocks to the west and south-west. The entrance is south of the island of Eleuthera.

EXUN'DATE, *v. a.*, EXUNDA'TION, *n. s.* Lat. *exundo*. To overflow; abundance.

It is more worthy the Deity to attribute the creation of the world to the *exundation* and overflowing of his transcendant and infinite goodness. *Ray.*

EXU'PERABLE, *adj.*, EXU'PERANCE, *n. s.* Latin, *exuperailis*, *exuperantia*. Conquerable; vincible: overbalance; greater proportion.

Rome hath less variation than London; for on the west side of Rome are seated France, Spain, and Germany, which take off the *exuperance*, and balance the vigour of the eastern parts. *Browne.*

EXUS'CITATE, *v. a.* Latin, *exsuscito*. To stir up; to rouse.

EXUS'TION, *n. s.* Lat. *exustio*. The act of burning up; consumption by fire.

EXU'VIÆ, *n. s.* Latin. Cast skins; cast shells; whatever is thrown off, or shed by animals.

They appear to be only the skins or *exuviæ* rather than entire bodies of fishes. *Woodward.*

EY'AS, *n. s.* Fr. *niais*. A young hawk just taken from the nest, not able to prey for itself.

Like *eyas* hauke up mounts unto the skies,
His newly budded pinions to assay,
And marveiles at himselfe stil as he flies;
So new this new-born knight to battell new did rise.
*Spenser's Faerie Queene.*

An aiery of children, like *eyases*, that cry out. *Shakspeare.*

EY'ASMUSKET, *n. s.* A young unfledged male hawk of the musket kind.

Here comes little Robin.—How now, my *eyasmusket*; what news with you? *Shakspeare.*

EYBEN (Hulderic), a Saxon lawyer of eminence, was born at Norden in East Friesland in 1629. He studied at Marpurg, and took his doctor's degree in 1655; soon after which he was appointed professor of law; but in 1669 removed to Helmstadt, where he became counsellor, assessor, and a judge of the imperial chamber of

Lower Saxony. The emperor also raised him to the rank of nobility, with the station of aulic-counseller. He died in 1699. His works were printed at Strasburgh in 1708. His son Christian William was also a lawyer and antiquary. He wrote Dissertatio de ordine equestri veterum Romanorum, folio. He died in 1727.

EYBENSTOCK, a town of Saxony, in the circle of the Erzgebirg. Population 3150. It is seven miles south-west of Schwartzenberg.

EYCK (Hubert Van), a celebrated painter, founder of the Flemish school, was born at Maaseyk in 1366. He first painted in distemper, which practice he relinquished for oil painting. There is a picture by him in the cathedral of Ghent, of which Sir Joshua Reynolds speaks highly, in regard to the heads and the landscape. Van Eyck died in 1426.

Eyck (John Van), brother of the preceding, and also an eminent painter, was born in 1370, and is said to have discovered the method of painting in oil, by accidentally finding that his colors mixed better with that than with water. He excelled as an artist in producing a richness of effect in his coloring, and labored his pictures highly. There is a Nativity by him at Wilton, in which the colors are remarkably fresh. It should be observed, however, that Raspe has almost demonstrated the futility of his claim to the invention of oil painting. In the collection of the duke of Orleans was a picture by him, representing the Wise Men's Offering; and it is said that a capital painting by John Van Eyck, of the Lord Clifford and his Family, was at Chiswick, in the collection of the late earl of Burlington. He died in 1441.—In the Exchequer Rolls are bills of charges on account of oil for the painters, a century at least previous to the period in question.

EYE, *n. s., v. a.* & *v. n.*
Eye-ball,
Eye-beam,
Eye-bright,
Eye-brightening, *adj.*
Eye-brow, *n. s.*
Eyed, *adj.*
Eye-drop, *n. s.*
Eyer,
Eye-glance,
Eye-glass,
Eye-glutting, *adj.*
Eye-lash, *n. s.*
Eyeless, *adj.*
Eyelet, *n. s.*
Eyelid,
Eye-offending, *adj.*
Eye-salve, *n. s.*
Eye-service,
Eyeshot,
Eyesight,
Eyesore,
Eye-spotted, *adj.*
Eye-string, *n. s.*
Eye-tipped, *adj.*
Eye-tooth, *n. s.*
Eyewink,
Eye-witness,
Eyliad,

Sax. eaᵹ; Teut. *aug*; Goth. *auga*; Swed. *oga*; Belg. *oog*; Isl. *eiga*; Span. *ojo*; Scotch *ee*, pl. *eene* (our obsolete plural is eyen, eyne, and *yghen*, see the examples). The organ of vision; sight; hence, ocular knowledge, look, aspect, line of sight, notice, vigilance; opinion formed by observing; view; mental perception: the importance of this organ has induced frequent comparisons with its form, color, socket, &c.; hence eye also means any central or chief ornament; a bud; a small but striking shade of color; a small perforation, &c. To eye is to watch; observe attentively; spy; regard with malice: and Shakspeare uses it as a neuter verb for to appear. Eye-ball is the globe, apple, or pupil of the eye; eye-beam a glance of or from the eye; eye-bright, a common flower, see Euphrasy; eye-brow, the beautiful defensive arch of hair over the eye; eyed (used only in composition) having eyes; eye-drop, a tear; eyer, a close observer; eye-glance, a quick notice or direction of the eye; eyelash, the line of hair that edges the eye-lid; eyelet, a small hole or perforation; eyelid, the well known membrane that protects the eye; eye-service, a service only in operation when watched; eyeshot, glance, range or length of view; eye-sore, something that offends the eye or sight; eye-spotted, marked with spots resembling eyes; eye-string, the tendon that moves the eye; eye-tipped, tipped or terminated with eyes; eye-tooth, the tooth of the upper jaw next on each side of the grinders; eye-wink, a hint or wink from the eye; eye-witness, an ocular evidence: one who speaks from personal observation. An eyliad is an eye-glance. We have thus, at the hazard of prolixity, explained, we believe, every thing that can need elucidation in these compounds.

The lanterne of thi bodi is thin *yghe*.
*Wiclif. Luk* 11.

And whanne hise *yghen* weren cast up into his disciples: he seyde, blessyd be ye pore men: for the kingdom of God is youre. *Id. Luk* 6.

He kept him as the apple of his *eye*.
*Deut.* xxxii. 10.

On the seventh day he shall shave all his hair off his head, his beard and his *eyebrows*. *Lev.* xiv. 9.

The Lord hath recompensed me according to my cleanness in his *eyesight*. 2 *Sam.*

On my *eyelids* is the shadow of death. *Job* xvi. 16.

He that hath a bountiful *eye* shall be blessed.
*Proverbs.*

Who hath bewitched you, that you should not obey the truth, before whose *eyes* Jesus Christ hath been evidently set forth? *Gal.* iii. 1.

The *eyes* of your understanding being enlightened.
*Eph.* i.

Servants, obey in all things your masters; not with *eyeservice*, as men-pleasers, but in singleness of heart.
*Col.* iii.

We made known unto you the power and coming of our Lord Jesus Christ, and were *eyewitnesses* of his majesty. 2 *Peter.*

His *eyen* twinkeled in his hed aright
As don the sterres in a frosty night.
*Chaucer. Prologue to Cant. Tales.*

But adding new
Feare to his first amazement, staring wyde
With stony *eyes* and hartless hollow hew,
Astonished stood. *Spenser. Faerie Queene.*

But being up, he lookt againe aloft,
As if he never had received fall,
And with sterne *eye-brows* stared at him oft,
As if he would have daunted him withall. *Id.*

His countenance was bold, and bashed not
For Guyon's looks; but scornful *eyeglance* at him shot. *Id.*

'Mammon,' said he, 'thy godhead's vaunt is vain,
And idle offers of thy golden fee;
To them that covet such *eye-glittering* gaine,
Proffer thy gifts, and fitter servaunts entertaine'. *Id.*

The drouping night thus creepeth on them fast,
And the sad humor loading their *eye-liddes*,
As messenger of Morpheus on them cast
Sweet slombring deaw, the which to sleepe them biddes. *Id.*

When they are laid in garrison, they may better hide their defaults than when they are in camp, where they are continually *eyed* and noted of all men. *Spenser on Ireland.*

Some reliques of the true antiquity,
Though disfigured, a well-*eyed* man
May happily discover. *Spenser.*

Nor Juno's bird, in her *eyespotted* train,
So many goodly colours doth contain. *Id.*

It hath, in their *eye*, no great affinity with the form of the church of Rome. *Hooker.*

Lawmakers must have an *eye* to the place where, and to the men amongst whom. *Id.*

Hath the church of Christ, from the first beginning, by a secret universal instinct of God's good spirit, always tied itself to end neither sermon, nor almost any speech of moment, which hath concerned matters of God, without some special words of honour and glory to the Trinity, which we all adore; and is the like conclusion of psalms become now, at length, an *eye-sore*, or a galling to the ears that hear it? *Id.*

Nor doth the *eye* itself,
That most pure spirit of sense, behold itself,
Not going from itself; but eyes opposed,
Salute each other with each other's form. *Shakspeare.*

Good sir John, as you have one *eye* upon my follies, turn another into the register of your own, that I may pass with a reproof off the easier. *Id.*

Vouchsafe, bright moon, and these thy stars to shine,
Those clouds removed, upon our watry *eyne*. *Id.*

I'll say yon grey is not the morning's *eye*,
'Tis but the pale reflex of Cynthia's brow. *Id.*

There shall he practise tilts and tournaments,
Hear sweet discourse, converse with noblemen;
And be, in *eye* of every exercise,
Worthy his youth and nobleness of birth. *Id.*

To justify this worthy nobleman,
Her shall you hear disproved to your *eyes*. *Id.*

I'll not be made a soft and dull-*eyed* fool,
To shake the head, relent, and sigh, and yield
To Christian intercessors. *Id.*

Fetch me that flower; the herb I shewed thee once;
The juice of it, on sleeping *eyelids* laid,
Will make or man or woman madly doat
Upon the next live creature that it sees. *Id.*

Methinks I see thee, now thou art below,
As one dead in the bottom of a tomb;
Either my *eyesight* fails, or thou look'st pale. *Id.*

Fy, doff this habit; shame to your estate,
And *eyesore* to our solemn festival. *Id.*

They would have won any woman's heart; and, I warrant you, they could never get an *eyewink* of her. *Id.*

Full many a lady
I've *eyed* with best regard. *Id. Tempest.*

The ground indeed is tawny.
— With an *eye* of green in't. *Id.*

Be subject to no sight but mine: invisible
To every *eyeball* else. *Id.*

The kitchen Malkin pins
Her richest lockram 'bout her reeky neck,
Clambering the walls to *eye* him. *Id. Coriolanus.*

Forgive me,
Since my becomings kill me when they do not
*Eye* well to you. *Id. Antony and Cleopatra.*

The lover,
Sighing like a furnace, with a woful ballad
Made to his mistress' *eyebrow*. *Id. As You Like It.*

That tyranny which never quaft but blood,
Would, by beholding him, have washed his knife
With gentle *eyedrops*. *Id. Henry VI.*

A proclaimed prize! most happy!
That *eyeless* head of thine was first framed flesh
To raise my fortunes. *Id. King Lear.*

I would have broke mine *eyestrings*; crack them, but
To look upon him. *Id. Cymbeline.*

Seekanauk, a kinde of crusty shel-fish, which is good meat, about a foot in bredth, hauing a crusty taile, many legges like a crab, and her *eyes* in her back. They are found in shallowes of waters, and sometime on the shore.
*Hakluyt. Voyage, &c. M. Thomas Hariot*, vol. iii. fol. 274.

That planet would, unto our *eyes*, descrying only that part whereon the light falls, appear to be horned, as the moon seems. *Raleigh.*

As long looking against the sun or fire hurteth the *eye* by dilation; so curious printing in small volumes, and reading of small letters, do hurt the *eye* by contraction. *Bacon.*

None should be put into either of those commissions, with an *eye* of favour to their persons, to give them countenance or reputation in the places where they live. *Id. to Villiers.*

The Turks have a black powder, made of a mineral called alcohol, which, with a fine long pencil, they lay under their *eyelids*, which doth colour black, whereby the white of the eye is set off more white. *Id. Natural History.*

If the English had driven the Irish into the open countries, where they might have an *eye* and observation upon them, the Irish had been easily kept in order. *Davies on Ireland.*

— In some open place, that to the sun doth lye,
His fumitorie gets, and *eye-bright* for the *eye*. *Drayton.*

I was as far from meditating a war, as I was, in the *eye* of the world, from having any preparations for one. *King Charles.*

Satan, like the raven, first seizes upon the *eye* of understanding, and then preys freely upon the other carcase. *Bp. Hall.*

These *eyes* and ears of state are necessary to the well-being of the head. *Id.*

This dignity was an *eye-sore* to these Levites and these Reubenites, ye take too much upon you, ye sons of Levi. *Id Contemplations.*

As soon as the two lords came thither they covered, to the trouble of the other; but, having presently to speak, they were quickly freed from that *eyesore*. *Clarendon.*

Mine *eyes* he closed, but open left the cell
Of fancy, my internal sight. *Milton's Paradise Lost.*

To the ocean now I fly,
And those happy climes that lie
Where day never shuts his *eye*,
Up in the broad fields of the sky. *Milton.*

Bold deed thou hast presumed, adventurous Eve,
And peril great provoked, who thus hast dared,
Had it been only coveting to *eye*
That sacred fruit. *Id.*

Some *eye-brightening* electuary of knowledge and foresight. *Id.*

Promise was, that I
Should Israel from Philistian yoke deliver:
Ask for this great deliverer now, and find him
*Eyeless* in Gaza, at the mill with slaves. *Id.*

Though sight be lost,
Life yet hath many solaces, enjoyed
Where other senses want not their delights,
At home in leisure and domestick ease,
Exempt from many a care and chance, to which
*Eyesight* exposes daily men abroad. *Id. Agonistes.*

To meet him all his saints, who silent stood
*Eyewitnesses* of his almighty acts,
With jubilee advanced. *Milton.*

Such a story as the basilisk is that of the wolf, concerning priority of vision, that a man becomes hoarse and dumb, if the wolf have the advantage first to *eye* him. *Browne.*

Then gave it to his faithful squire,
With lessons how to observe and *eye* her.
*Hudibras.*

Prune and cut off all your vine shoots to the very root, save one or two of the stoutest, to be left with three or four *eyes* of young wood. *Evelyn's Kalendar.*

The suitor was a diligent *eyer* of her.
*Gayton.*

She told her husband she designed to be beautiful in nobody's *eye* but his. *Sidney.*

Not satisfied with our oath, he appointed a band of horsemen to have an *eye* that we should not go beyond appointed limits. *Id.*

Though he in all the people's *eyes* seemed great,
Yet greater he appeared in his retreat. *Denham.*

Red with an *eye* of blue makes a purple.
*Boyle.*

Those parts if they cohere to one another but by rest only, may be much more easily dissociated, and put into motion by any external body, than they could be, if they were by little hooks and *eyes* or other kinds of fastenings entangled in one another.
*Id.*

His awful presence did the crowd surprize,
Nor durst the rash spectator meet his *eyes*;
*Eyes* that confessed him born for kingly sway,
So fierce, they flashed intolerable day. *Dryden.*
Now passed, on either side they nimbly tack,
Both strive to intercept and guide the wind;
And in its *eye* more closely they come back,
To finish all the deaths they left behind. *Id.*
Misdoubt my constancy; and do not try;
But stay and ever keep me in your *eye*. *Id.*
I feel my hair grow stiff, my *eyeballs* roll;
This is the only form could shake my soul. *Id.*
The balls of his broad *eyes* rolled in his head,
And glared betwixt a yellow and a red;
He looked a lion with a gloomy star,
And o'er his *eyebrows* hung his matted hair. *Id.*
At length the crackling noise and dreadful blaze
Called up some waking lover to the sight;
And long it was ere he the rest could raise,
Whose heavy *eyelids* yet were full of night. *Id.*
He blinds the wise, gives *eyesight* to the blind,
And moulds and stamps anew the lover's mind. *Id.*

I must not think of sharing the booty before I am free from danger, and out of *eyeshot* from the other windows. *Id.*

He's the best piece of man's flesh in the market; not an *eyesore* in his whole body. *Id. Don Sebastian.*

Josephus sets this down from his own *eyesight*, being himself a chief captain at the siege of Jopata, where these events happened. *Wilkins.*

After this jealousy he kept a strict *eye* upon him.
*L'Estrange.*

Mordecai was an *eyesore* to Haman. *Id.*

This method of teaching children by a repeated practice, under the *eye* and direction of the tutor, till they have got the habit of doing well, has many advantages. *Locke.*

Above stand the *eyebrows*, to keep any thing from running down upon the *eyes*; as drops of sweat from the forehead, or dust. *Ray.*

The next teeth on each side stronger and deeper rooted, and more pointed, called canini, in English *eyeteeth*, to tear the more tough sort of aliments.
*Id. on the Creation.*

Does not our Saviour himself speak of the intolerable difficulty which they cause in men's passage to heaven? Do not they make the narrow way much narrower, and contract the gate which leads to life to the straitness of a needle's *eye*? *South.*

In this disposal of my sister, I have had an *eye* to her being a wit, and provided that the bridegroom be a man of sound judgment. *Tatler.*

A beautiful *eye* makes silence eloquent, a kind *eye* makes contradiction an assent, an enraged *eye* makes beauty deformed. This little member gives life to every other part about us, and I believe the story of Argus implies no more, than that the *eye* is in every part; that is to say, every other part would be mutilated, were not its force represented more by the *eye* than even by itself. *Spectator.*

We were the most obedient creatures in the world, constant to our duty, and kept a steady *eye* on the end for which we were sent hither. *Id.*

I have preserved many a young man from her *eyeshot* by this means. *Id.*

There is nothing so bad for the face as a party zeal. It gives an ill-natured cast to the *eye*, and a disagreeable sourness to the look. *Addison.*

Booksellers mention with respect the authors they have printed, and consequently have an *eye* to their own advantage. *Id.*

Penthens durst deride
The cheated people, and the *eyeless* guide. *Id.*

The curious, by laying together circumstances, attestations, and characters of those who are concerned in them, either receive or reject what at first but *eyewitnesses* could absolutely believe or disbelieve.
*Addison on the Christian Religion.*

Winds and hurricanes at land, tempests and storms at sea, have always been looked upon with as evil an *eye* as earthquakes. *Woodward's Nat. Hist.*

We see colours like the *eye* of a peacock's feather, by pressing our eyes on either corner, whilst we look the other way. *Newton.*

Mæonides,
Poor *eyeless* pilgrim. *Phillips.*

Slitting the back and fingers of a glove, I made *eyelet* holes to draw it close. *Wiseman's Surgery.*

To know whether the sheep are sound or not, see that their gums be red and the *eyestrings* ruddy.
*Mortimer.*

But sure the *eye* of time beholds no name
So blest as thine in all the rolls of fame. *Pope.*
*Eye* nature's walks, shoot folly as it flies,
And catch the manner's living as they rise. *Id.*

Not when a gilt buffet's reflected pride
Turns you from sound philosophy aside,
Not when from plate to plate your *eyeballs* roll,
And the brain dances to the mantling bowl. *Id.*

Cyclop, if any pitying thy disgrace,
Ask who disfigured thus that *eyeless* face. *Id.*

It was needful for the hare perpetually to *eye* her pursuing enemy.
*More's Antidote against Atheism.*

Long, pity! let the nations view
Thy sky-worn robes of tenderest blue,
And *eyes* of dewy light. *Collins.*

O might reflection folly's place supply,
Would we one moment use her piercing *eye*,
Then should we know what woe from grandeur springs,
And learn to pity, not to envy kings. *Churchill.*

True happiness ne'er entered at an *eye*,
True happiness resides in things unseen. *Young.*

The *eye* that will not weep at other's sorrow,
Should boast no gentler brightness than the glare
That reddens in the *eyeball* of the wolf. *Mason.*

The beauty of the *eye* consists, first in its clearness; what coloured *eye* shall please most depends a good deal on particular fancies; but none are pleased with an *eye* whose water (to use that term) is dull and muddy. We are pleased with the *eye* in this view, on the principle upon which we like diamonds.

*Burke.*

His to enjoy
With a propriety that none can feel,
But who, with filial confidence inspired,
Can lift to Heaven an unpresumptuous *eye*,
And smiling say—My Father made them all!

*Cowper.*

Forth comes the pocket mirror.—First we stroke
An *eyebrow*; next compose a straggling lock;
Then with an air most gracefully performed
Fall back into our seat, extend an arm,
And lay it at its ease with gentle care,
With handkerchief in hand depending low. *Id.*

From each nice pore of ocean, earth, and air,
With *eye* of flame the sparkling hosts repair,
Mix their gay hues, in changeful circles play,
Like motes, that tenant the meridian ray.

*Darwin.*

Now with young Wonder touch the sliding snail,
Admire his *eye-tipped* horns, and painted mail. *Id.*

Grief dimmed her radiant *eyes*,
Her swelling bosom heaved with boding sighs:
She *eyed* the main; where, gaining on the view,
Emerging from the ethereal blue,
Midst the dread pomp of war
Gleamed the Iberian streamer from afar. *Beattie.*

Which to explore
Even Fancy trembles, in her sprightliest mood;
For there, each *eye-ball* gleams with lust of gore,
Nestles each murderous and each monstrous brood,
Plague lurks in every shade, and steams from every flood. *Id.*

She views her mirror; but how starts her *eye*,
Strange wrinkles on her faded brow to spy!
And, ah, her bloomless cheeks; what dæmon's rage
Has chilled their blush with sallow tints of age?

*Dr. T. Brown.*

-I write in haste, and if a stain
Be on this sheet, 'tis not what it appears,
My *eyeballs* burn and throb, but have no tears.

*Byron.*

Her glossy hair was clustered o'er a brow
Bright with intelligence, and fair and smooth;
Her *eyebrow's* shape was like the aerial bow,
Her cheek all purple with the beam of youth,
Mounting, at times, to a transparent glow,
As if her veins ran lightning! *Id.*

A slight blush, a soft tremor, a calm kind
Of gentle feminine delight, and shown
More in the *eyelids* than the *eyes*, resigned
Rather to hide what pleases most unknown,
Are the best tokens (to a modest mind)
Of love, when seated on his loveliest throne,
A sincere woman's breast,—for ever warm,
Or ever cold annihilates the charm. *Id.*

At the line formed by the *eye-lashes*, the skin becomes changed in appearance and structure, and we observe continued from it a mucous membrane, called, from its office, the conjunctiva, which, after investing the posterior surface of the tarsi, is reflected over the front of the eye-ball. *D. A. Rees.*

EYE, in anatomy, the organ of sight. This has already been described by us in the article ANATOMY, par. 188—208. But some general remarks on its physiology and diseases have been reserved for this place.

## PART I.

### OF THE PHYSIOLOGY OF THE EYE.

It is well ascertained by experiment that the rays proceeding from any object to the eye undergo certain changes in their passage through the transparent parts of the organ; that these changes ultimately collect the rays, proceeding from the several points of the object, into opposite corresponding focal, or nearly focal points on the retina; and that the impression thus produced causes the perception of the object. An interesting proof of this may be obtained thus:—Let an eye, from which the back of the sclerotica and choroid has been carefully removed, and their place supplied by oiled paper, or by the membrane which lines the shell of an egg, be placed in a room with a candle, with the cornea towards the luminous object. A diminished image of the candle will now be represented inverted on the paper.

We shall endeavour to trace the rays from the surface of the cornea to their collection into foci on the retina, giving the change of direction in general terms. 1. The pencils of rays radiating from any object, when they arrive at the surface of the cornea, are found to form cones, the points of which are at the object, and the bases on the cornea. Those which strike on the opaque sclerotica are reflected, and have no concern in vision: and those which, falling very obliquely, make a considerable angle with the cornea, are also reflected without penetrating into the aqueous humor. The rays, which fall within an angle of about 48°, pass through this membrane, undergoing a certain refraction, by which they are brought nearer to the line of the axis of the cornea; and, if produced, would converge into a focal point beyond the interior of the eye. The rays pass from the cornea into the aqueous humor, and are divided by the dispersive powers of this fluid, so that, if continued in the same medium, they would not only converge beyond the back of the eye, but, on account of the aberration caused by their different refrangibility, would produce a confused and colored image.

2. The rays collected by the cornea pass through the pupil. Those which come in an unfavorable direction are either reflected by the iris, or absorbed by the pigmentum on its posterior surface. The pupil admits only those rays which are the nearest the axis of vision. They then meet with the crystalline humor, which collects them, and brings them into foci, after passing through the less refractive medium of the vitreous humor on the concave surface of the retina. They do not impart a correct perception of the body which reflects them, unless they fall on the retina precisely in the order in which they are detached from that body.

3. The cone of rays proceeding from any luminous point to the cornea forms another cone, the apex of which falls on the retina. These two cones have their axes almost in a straight line. That which is perpendicular to the middle of the crystalline proceeds directly to the bottom of the eye; that which comes from above

falls inferiorly; that on the left proceeds to the right, and so on with respect to the others: thus an inverted image is formed on the retina.

4. The iris, by altering the diameter of the pupil, will influence immediately the quantity of light admitted into the eye. If one eye is closed, and we continue to look at the same object, the pupil of the open eye dilates evidently, and contracts again, as the other is opened, to its former diameter. The iris also intercepts such rays as would fall on parts incapable of refracting them regularly, or such as are directed so obliquely on the cornea as to be too much refracted, admitting only the smaller pencil which enters the eye more in the direction of its axis. This, however, but partially, and only in cases where the opening of the pupil is circular, and where the confusion which would arise from the aberration of the extreme lateral rays may possibly be prevented: it is not the case where the opening is very much extended, oblong, vertical, and, in some circumstances, almost linear, as in the cat. The eccentricity of the pupil can only so far influence the pencils of rays as to make them fall on the anterior vertex of the crystalline, with which it corresponds: the axes of the pupil, and the lens, do not correspond with that of the cornea. It appears from careful observations that this contraction and dilatation are irregular and limited; that by bringing the object nearer to the eye, within a certain distance, the pupil not only ceases to contract, but becomes again dilated; and that, beyond a few yards distance, it also ceases to dilate. In viewing the sun, instead of dilating according to the distance, it contracts most closely, obeying the quantity and intensity of the light, rather than the distance of the object. In viewing a less luminous object, the pupil dilates, when it is more distant, a greater quantity of light being necessary to produce a clear impression; as the object is brought nearer, we require a less degree of light, and the iris contracts to exclude what is superfluous. Thus far the iris may be useful in accommodating the eye to different distances; it may regulate the quantity of light, but it cannot alter the direction. In quiescent vision, the pupil preserves its diameter most steadily.

5. The crystalline lens being found to diminish in density gradually in every direction, approaching the vitreous humor on one side, and the aqueous on the other, Mr. Ramsden supposes that its refractive power is the same with that of the two contiguous substances. Its principal use appears to him to be that of correcting the aberration arising from the spherical figure of the cornea, where the principal part of the refraction takes place. From the constitution of the crystalline he inferred, that it will refract the rays of light without reflecting any of them; so that, although we have two surfaces of the aqueous, two of the crystalline, and two of the vitreous humor, we have only one reflected image, and, that being from the front of the cornea, there can be no surface to reflect it back, and dilate the image on the retina. If the surfaces of the crystalline had been abrupt, there must have been a reflection at each, and an apparent haziness would have interfered with the distinct view of every luminous object. The smaller density of the lateral parts will not only correct the aberration of the spherical surface of the cornea, but will cause also the focus of each oblique pencil of rays to fall either accurately, or very nearly so, on the concave surface of the retina, throughout its extent. Had the refractive power been uniform, throughout the whole substance of the lens, it might have collected the lateral rays of a direct pencil nearly as well, but it would have been less adapted to the oblique pencils of rays. Also, the gradual increase of density in approaching the centre makes the crystalline equivalent to a much more refractive substance of equal magnitude. The principal use of the vitreous humor appears to be that of giving a ready passage to the rays of light, as they are converging into foci on the retina, and of keeping at the same time the surface of the latter uniformly spherical. It would allow a change of figure in the eye, or in the lens, or even a change of place in the latter, supposing there were powers in the living organ adequate to the purpose.

6. Some writers have contended that the retina is not equally sensible in all parts, and that a portion only, near the axis of the eye, is capable of conveying distinct impressions. Comparetti says that distinct vision is effected only in the optic axis, which is moved most rapidly over every point of the object; and that what is seen apparently out of the axis is caused by the direction of the first impression in the axis. We believe, however, that the limits of distinct vision are far more extensive. Dr. Young says, of his own eye, that the visual axis being fixed in any direction, he can see at the same time a luminous object placed at considerable distances from it; the angle, however, differs. The extent of the retina is every way greater than the limits of the field of view. The whole extent of perfect vision is little more than ten degrees; or, more strictly speaking, the imperfection begins within a degree or two of the visual axis, and at the distance of 5° or 6° becomes nearly stationary, until, at a still greater distance, vision is wholly extinguished. The imperfection may be owing partly to the unavoidable aberration of oblique rays, but principally to the insensibility of the retina; for, if the image of the sun itself be received on a part of the retina remote from the axis, the impression will not be sufficiently strong to form a permanent spectrum, although an object of very moderate brightness will produce this effect when distinctly viewed. The motion of the eye has a range of about 55° in every direction, so that the field of perfect vision, in succession, is by this motion extended to 110°.

7. It results from some experiments of Haldat's, made by producing an artificial strabismus, that the opinion, which limits the position in which an image can be be seen distinctly to a point at the bottom of the eye, is by no means reconcileable with actual observation. For, in an artificial strabismus, one of the impressions falling on a part without the visual axis, ought not to produce any perception of the object; this we know not to be the case. From this

fact alone we may conclude that the place of the image is not necessarily confined to the axis, but that many points of the surface of the retina are capable of conveying an impression of it. As the angle is increased, the perfection of the image may be lessened; but we do not lose the perception of it until its position is such, that none of the rays proceeding from it directly can be brought to converge on the posterior hemisphere of the globe. This would appear to conform also with our ideas of the use of the extent of the retina, for which, if the field of vision was so extremely limited, we could assign no reason. The points of it, at a distance from the axis, may be less favorably disposed, but are not perhaps less susceptible of being affected. 'The whole of the retina is of such a form as to receive the most perfect image on every part of its surface, that the state of each refracted pencil will admit; and the varying density of the crystalline renders that state more capable of delineating such a picture than any other imaginable contrivance could have done.' Dr. Young has given a diagram, representing the successive images of a distant object filling the whole extent of view, as they would be formed by the successive refractions of the different surfaces. But in opposition to the observations given above, respecting the decreasing sensibility of the retina remarked by Dr. Young, it has been observed that, on comparing the impressions produced by rays parallel to the optic axis with those by rays much inclined to this axis, they have appeared to differ in intensity only in a degree corresponding to the diminution in the extent of the opening of the pupil, produced by the obliquity of its plane to the luminous rays, and by the obliquity of the rays themselves to the refracting substances through which they pass. At the most, the difference of the clearness of the impression is not such as it would be if it depended on a diminution of the sensibility of the retina, proportionate to its distance from the optic axis. Notwithstanding the influence of the causes just mentioned, the light of a candle passing into both eyes, when their axes are artificially inclined, so that the images make angles of 15° to 25° with the optic axis, suffers no apparent diminution of brightness. This fact certainly gives to the field of distinct vision a more considerable extent than that usually assigned it. The point of the retina, which corresponds to the optic axis, may possibly be the place of most perfect vision; not because it is endowed with a greater sensibility than other parts of the retina, but from its being in the exact focus of the refractive powers of the eye, and the only point where the image can be impressed with every perfection.

8. In considering the sensibility of the retina, the office of the pigmentum must not be overlooked. In the human subject this is always more or less dark. In animals, where the pigmentum is more than of one color in the same eye, the lighter portion is always placed at the bottom of the eye, including the entrance of the optic nerve in its sweep; the color varies in different animals, but has always a brilliant surface. Probably the light has a greater effect on the retina in eyes which have a white pigmentum, than in such as possess a dark one. Hence all animals see more or less distinctly in the dark, according as their lucid tapetum approaches nearer to white or black color. Man, in whom it is dark, sees very imperfectly in a light where a cat, or dog, would perceive objects with tolerable clearness. We may observe that, when either of the latter look at us in the dark, the whole pupil is enlarged and illuminated; but in a full light there is no such appearance. Here there must be a reflection of light from the bottom of the eye to produce the effect; and the reflected light is always of the same color with the tapetum. Those individuals of our species who have a light pigmentum, see much better with less light than those who have it dark. In the Albino, where the coloring matter is exceedingly thin, or wholly deficient, the common day-light is far too powerful to admit of distinct vision. When he attempts to examine the qualities of an object with precision, the eye-brows are knit, and the eye-lids kept almost shut. In the twilight he can see more plainly, as the luminous rays are then not too intense for the very sensible retina. The ferret is destined, from its mode of life, to see in dark places; and its pigmentum is naturally w[illegible] The rays which pass through the transparent retina are disposed of according to the reflecting powers of the pigmentum. In man, who requires distinct vision in a moderate light, rather than the power of seeing where light is almost wholly wanting, the pigmentum is dark, and the rays are absorbed, and entirely lost; therefore, in such eyes, it can add nothing to acuteness of vision, and a considerable quantity of light is required to produce an adequate impression on the retina. The rays are then lost the pigmentum, and the accuracy of the image is no way impeded. In animals, who require a great acuteness of sight, the rays, reflected from a light and brilliant surface, again impress the retina, and increase the power of vision. The interval of time is too short, and the distance between the points they may strike in their double passage too minute, to occasion any indistinctness of the image. Distinct vision requires that the object should be fixed, and not allowed to move over the surface of the retina. To accomplish this object, the muscles of the globe are employed in the manner above described. We believe the impression made on the retina by the luminous rays to be in some degree permanent, and the more so as the light is stronger. The duration may vary probably from one hundredth of a second to nearly a second. Hence, the well-known phenomenon of the circle of light in revolving a lighted stick. If the object is painfully bright, the sensation is more permanent, and vanishes at last gradually.

9. Images of what we see are pictured inverted on the retina, and much controversy has arisen as to the cause of our perceiving the objects erect. If it be allowed that we judge of the situation of each luminous point by the direction of the rays it transmits, it follows that we must see bodies as we really do see them, in their proper position. The opinion that we really see objects reversed, and correct the sensation by

experience and judgment, derived from the other senses, is liable to very numerous objections. The chick just hatched knows where to direct its bill; and persons born blind, who have suddenly gained their sight, see objects in their proper position. We do not see the picture on the retina, but the object itself in the direction of each of the rays which conveys to us the sensation, or, to speak more correctly, in the direction of the axis of that pyramid which a pencil of divergent rays forms in proceeding from any point of an object to the eye. Bishop Berkeley explains the supposed difficulty in another way; he does not allow that we can estimate the situation of parts or objects by the decussation and direction of the rays of light, as the mind neither perceives the intersections of the radious pencils, nor pursues the impulses they give in right lines: without perceiving them it cannot form a judgment, and it cannot perceive them without a consciousness of such perception. The situation of visible objects must be entirely relative, and depend on the place which they occupy with regard to each other. And, as all visible objects are inverted at the same instant, each will be in the same relative situation on the retina as it is in actually. Thus the terms of above and below are arbitrary expressions, by which it is agreed to call upper what corresponds to the heavens, and lower what corresponds to the earth. Now it is evident that, at the bottom of the eye, the situation of these is inverted; the earth is above, and the heavens below. We call that the lower end of an object which is nearest the ground; and, the image of a man's feet being in contact with the image of the earth on the retina, we naturally infer that they are in contact with the actual earth; the head being more remote from the earth, we suppose that it is higher. The confusion has arisen from mixing the ideas derived from the different sensations of sight and touch. 'You say,' to use the words of Dr. Berkeley, 'the picture of the man is inverted, and yet the appearance is erect. I ask you what mean you by the picture of the man, or, which is the same thing, the visible man's being inverted? You tell me it is inverted because the heels are uppermost, and the head undermost. Explain me this: you say that, by the head being undermost, you mean that it is nearest to the earth; and, by the heels being uppermost, that they are farthest from the earth. I ask, again, what earth you mean? You cannot mean the earth that is painted on the eye, or the visible earth; for the picture of the head is farthest from the picture of the earth, and the picture of the feet nearest the picture of the earth; and, accordingly, the visible head is farthest from the visible earth, and the visible feet nearest to it. It remains therefore that you mean the tangible earth, and so determine the situation of visible things with respect to tangible things, which is absurd, and perfectly unintelligible.'

10. Two distinct images are certainly painted, one upon each eye, and yet we only perceive a single object. Many explanations have been given of this phenomenon; the most satisfactory is, that in the two eyes there are corresponding parts of the retinæ, which are probably susceptible of the same impression in equal degree, and convey it to the sensorium in that equal degree: hence, as long as similar points of the images fall upon the corresponding points of the retinæ, the perception of the same object is single. It is double, for the same reason, whenever the disposition of the visual axes is deranged; and, by an artificial pressure on one of the eyes, we may so displace its visual axis, or point of most perfect vision, that the two images shall not fall on those parts of the retinæ of the two eyes usually impressed simultaneously; a double image is the consequence. In order to preserve the simplicity of perception, when we look at an object brought nearer to us, we make them converge towards it by means of the external muscles of the eye, which is further adjusted to the decreasing distance by some other of its powers, so as to convey a single and distinct image of the object.

11. In the year 1793 Dr. Young made some observations on the structure of the eye, and its provisions for adjustment, among which are accounts of the theories of adjustment, proposed by various earlier writers. Of these we shall say nothing, as a reference to the anatomical description of the eye, and other remarks already detailed, would at once refute the greater part of them. It was the opinion of Dr. Young that rays of light, passing from objects at a small distance, could only be brought to foci on the retina by a nearer approach of the crystalline to a spherical form; this change, he believed, was effected by the muscularity of the lens. In the following year, some observations of John Hunter on this subject were published by Mr. Home, from which it appears, that he had for many years entertained a notion, that the crystalline humor was enabled, by its own internal actions, to adjust itself, so as to adapt the eye to different distances. Mr. Hunter had instituted some experiments, but died before he had made sufficient progress to draw any conclusion. In the same year Dr. Hosack, in a paper on vision, controverts Dr. Young's deductions with regard to the muscularity of the lens, and attributes the effects produced in adjustment to the actions of the muscles. He assumes, as the necessary consequence of contraction in these muscles, that the axis of the eye will be elongated, and the elastic cornea rendered more convex; both which circumstances would tend to preserve distinctness of vision with regard to near objects. In order to prove that the eye is capable of having its focal adjustment considerably varied by external pressure, he applied the common speculum to his own eye, and, by increasing the pressure of it considerably, was enabled to see objects distinctly, though placed much nearer than the natural focal distance. The means here made use of to ascertain the fact do not appear to us very accurate. In the Croonian lecture for 1725 Mr. Home relates a series of experiments and observations made by himself and Mr. Ramsden, from which he concludes, that the eye has a power of adjusting itself to different distances, when deprived of the crystalline lens; and that, therefore, the supposed fibrous, and laminated structure of that lens, is not intended to alter its form, but to prevent reflections in the

passage of the rays through the surfaces of media of different densities, and to correct spherical aberrations; that the cornea is elastic, capable of being elongated one-eleventh of its diameter; that the tendons of the four straight muscles terminate in forming a lamina of the cornea; and that, in changing the focus of the eye from seeing with parallel rays to a near distance, there is a visible alteration produced in the figure of the cornea, rendering it more convex; and, when the eye is again adapted to parallel rays, the alteration by which the cornea is brought back to its former state is equally visible. The exertion required to adjust the eye to near distances, and the ease with which it is adapted to remote objects, proves that the first was a positive action, and the second a relief. The defect of elasticity in the cornea, inferred to arise from age, is applied to explain the changes of vision which take place in advanced life. By some further experiments Mr. Ramsden and Mr. Home were induced to abandon the opinion that the adjustment is produced solely by the alteration of the convexity of the cornea, which might probably be sufficient when the lens was removed, but not when the eye is entire. Mr. Home assumes that the action of the straight muscles will elongate also the axis of the eye, and produce an effect upon the crystalline lens, and ciliary processes, pushing them forward in proportion as the cornea is stretched. Granting these two last changes, Mr. Ramsden computed that the increase of the curvature of the cornea may be capable of producing one-third of the effect, and that the change of place of the lens, and elongation of the axis of vision, sufficiently account for the other two-thirds of the quantity of adjustment necessary to make up the whole.

In the year 1800 was published an excellent paper by Dr. Young, on the mechanism of the eye, in which he examines, with great acuteness and accuracy, the different opinions on this subject. It is impossible for us here to give an abstract of his observations; we must refer the reader to the paper itself, for the detail of all the proofs by which he endeavours to establish his opinion of an alteration in the figure of the crystalline, and give here only the general conclusions drawn from his investigations. 'The arguments in favor of an increase of the convexity of the crystalline lens are of two kinds; some of them are negative, derived from the impossibility of imagining any other mode of performing the accommodation without exceeding the limits of the actual dimensions of the eye, and from the examination of the eye, in its different states by several tests, capable of detecting any other changes if they had existed: for example, by the application of water to the cornea, which completely removes the effects of its convexity, without impairing the power of altering the focus, and by holding the eye, when turned inwards, in such a manner as to render any material alteration of its length utterly impossible. Other arguments are deduced from positive evidence of the change of form of the crystalline, furnished by the particular effects of refraction and aberration, which are observable in the different states of the eye; effects which furnish a direct proof that the figure of the lens must vary; its surfaces, which are nearly spherical, in the quiescent form of the lens, assuming a different determinable curvature, when it is called into exertion. The objections which have been made to this conclusion are founded only on the appearance of a slight alteration of focal length in an eye from which the crystalline had been extracted; but the fact is neither sufficiently ascertained, nor was the apparent change at all considerable: and even if it were proved that an eye without the lens is capable of a certain small alteration, it would by no means follow that it could undergo a change, five times, or ten times as great.'

12. Motions of the eye are either external or internal. The *external* motion is that performed by its four straight and two oblique muscles, whereby the whole globe of the eye changes its situation or direction. The spherical figure of our eyes, and the loose connexion to the edge of the orbit by the tunica conjunctiva, which is soft, flexible, and yielding, does excellently dispose them to be moved this or the other way, according to the situation of the object we would view. By the membranes the eye is connected to the edge of the orbit, which, being soft and flexible, they do in such a manner as not in the least to impede its necessary motions; and that great quantity of fat placed all round the globe, betwixt it and the orbit, lubricates and softens the eye, and renders its motions more easy: hence arise the three following remarkable observations:—

i. When nature has denied the head any motion, it is observable that she has, with great care and industry, provided for this defect. To this purpose belongs the surprisingly beautiful and curious mechanism observable in the immoveable eyes of flies, wasps, &c. They nearly resemble two protuberant hemispheres, each consisting of a prodigious number of other little segments of a sphere, all which segments are perforated by a hole, which may be called their pupil, in which this is remarkable; that every foramen, or pupil, is of a lenticular nature, so that we see objects through them topsy-turvy, as through so many convex glasses: they even become a small telescope, when there is a due focal distance between them and the lens of the microscope by which they are viewed. Leuwenhoek's observations make it probable that every lens of the cornea supplies the place of the crystalline humor, which seems to be wanting in those creatures; and that each has a distinct branch of the optic nerve answering to it, upon which the images are painted: so that as most animals are binocular, and spiders for the most part octonocular, so flies, &c., are multocular, having in effect as many eyes as there are perforations in the cornea, by which means (as other creatures with but two eyes are obliged, by the contraction of the muscles above-enumerated, to turn their eyes to objects) these have some or other of their pupils always ready placed towards objects nearly all around them: whence they are so far from being denied any benefit of this noble and most necessary sense of sight, that they have probably more of it than other crea-

tures, answering to their necessities and ways of living.

iii. As in man and most other creatures the eyes are situated in the head, because, among other reasons, it is the most convenient place for their defence and security, being composed of hard bones, wherein are formed two large strong sinuses, or sockets, commonly called orbits, for the convenient lodging of these tender organs, and securing them against external injuries; so in those creatures whose head, like their eyes and the rest of their body, is soft and without bones, nature has provided for this necessary and tender organ a wonderful kind of guard, by enduing the creature with a faculty of withdrawing his eyes into his head, and lodging them in the same safety within his body. We have a very beautiful example of this in snails, whose eyes are lodged in four horns, like atramentous spots, one at the end of each horn, which they can retract at pleasure when in any danger. Here it may be also observed, that the cornea in all animals that want eyelids, as fishes, exactly resembles in hardness the horn of a lantern; and therefore is not hurt by such particles as their eyes are commonly exposed to. And in the mole, because this animal lives under ground, it was necessary its eyes should be well guarded and defended against the many dangers and inconveniences to which its manner of living exposes it: this is the reason why its eyes are so small, and that they are situated so far in the head, and covered so strongly with hair; and besides, they can protrude and retract them at pleasure. The eyes of insects are more varied than in any other class of animals: for their form and distribution see ENTOMOLOGY.

iii. The third and last reflection we shall make upon the external motion of our eyes, is what regards a problem which has very much perplexed both physicians and philosophers, viz. What is the cause of the uniform motion of both eyes? In some creatures, such as fishes, birds, and among quadrupeds the hare, camelion, &c., the eyes are moved differently; the one towards one object, and the other towards another. But in man, sheep, oxen, and dogs, the motions are so uniform that they never fail to turn both towards the same place; hence in operations upon the eye that require it to be kept immoveable, sometimes it is necessary to tie up the sound eye with a compress, by which means the other is easier kept fixed and immoveable. The final cause of this uniform motion is, (1). That the sight may be thence rendered more strong and perfect: for since each eye apart impresses the mind with an idea of the same object, the impression must be more strong and lively when both eyes concur; and that both may concur it is necessary that they move uniformly; for though the retina, or immediate organ of vision, is expanded upon the whole bottom of the eye, as far as the ligamentum ciliare, yet nothing is clearly and distinctly seen but what the eye is directed to. (2.) Another advantage we reap from the uniform motion of the eyes, which is more considerable than the former, consists in our being thereby enabled to judge with more certainty of the distance of objects. (3.) There is yet another advantage, full as considerable as any of the former, that is thought to arise from the uniform motion of our eyes, and that is, the single appearance of objects seen with both our eyes; which, though at first view it does not appear probable, is true: for if in looking at an object you turn one of your eyes aside with your finger, and alter its direction, every thing will be seen double.

By the *internal* motions of the eye we understand those motions which only happen to some of its internal parts, such as the crystalline and iris; or to the whole eye when it changes its spherical figure and becomes oblong or flat. The internal motions of our eyes are either such as respect the change of conformation that is necessary for seeing distinctly at different distances, or such as only respect the dilatation and contraction of the pupil. That our eyes change their conformation, and accommodate themselves to the various distances of objects, will be evident to any person who but reflects on the manner and most obvious phenomena of vision. See VISION.

## PART II.

### OF THE DISEASES OF THE EYE.

The principal diseases of the eye are ophthalmia; opacities and ulcers in the cornea; pterygium and encanthis; staphyloma; cataract hypopium, dropsy, and cancer. For GUTTA SERENA, see that article. We shall exhibit the chief symptoms of these diseases in the foregoing order: referring to the articles MEDICINE and SURGERY, for a more particular description of the modes of treating them.

1. *Of Ophthalmia.*—Inflammation is the most frequent of all the disorders of the eyes, and there are few other diseases of these organs, of which it is not attendant. Of many, it is a necessary symptom or consequence. Pain and redness are its chief diagnostic symptoms; the latter one is particularly so, the healthy eye being free from all redness. But this appearance is not essential to ophthalmy; for many eyes, undergoing vehement inflammation, are little, or not at all, red. The internal ophthalmy is of this description. The red appearance, when present, is most evident in the white of the eye but, when the inflammation is severe, red vessels are frequently seen ramifying over the cornea Little vesicles, containing extravasated blood also sometimes form on this transparent membrane. The dark red swelling of the conjunctiva termed chemosis, arises from an effusion of blood into the loose cellular texture, which connects this membrane with the sclerotica. The eyelids also commonly partake of the redness attendant on ophthalmy. In mild cases, the pain may be compared with a sense of heat in the part affected, or with a sensation, seeming to arise from the lodgment of sand or dust, underneath the eyelids. In more severe instances there is a violent, burning, spasmodic, darting pain.

This disease is sometimes attended with diminution, or total loss of vision; and this unpleasant event may depend on opacity of the cornea, a closure of the pupil, or a paralytic stat

of the retina. Tumefaction, which accompanies inflammation in general, seems principally to affect, in these cases, the conjunctiva forming the white of the eye. In very violent ophthalmies, this membrane swells, in such a manner, that it covers the whole cornea, protruding like a thick fold between the eyelids, which cannot be shut. The whole eye-ball seems, on this occasion, like a portion of red flesh. The cornea is also liable to become considerably thickened, so as to come into contact with the iris, and adhere to it, or to form an opaque prominence forward, termed staphyloma. In ophthalmy, the eyelids also are not unfrequently very much swollen. Acute inflammations of the eyes are usually accompanied with the common symptoms of inflammatory fever, the constitutional disturbance being proportioned to the vehemence of the local affection.

In severe ophthalmy, two distinct stages are commonly observable; the first is attended with a great deal of heat and pain in the eye, and considerable febrile disorder; the second is, comparatively, a chronic affection, without pain and fever. The eye is merely weakened, moister than in the healthy state, and more or less red. The second stage is frequently very obstinate, and much more difficult to cure than the first.

Mr. James Wardrop has recommended puncturing the cornea, and letting out the aqueous humor, in certain cases of ophthalmy. This gentleman states, that in the living body the transparency of the cornea varies according to the degree of its distention, and that, in cases of opacity of the cornea, attended with fulness of the eyeball, the transparency of the above membrane may be restored by the evacuation of the aqueous humors. Mr. Wardrop first tried the experiment in a case, in which there was a considerable degree of milkiness and opacity of the cornea, and in which the eyeball appeared distended and prominent, attended with acute inflammatory symptoms. He discharged the aqueous humor by a small incision, and found that the operation produced, not only an alteration in the degree of the transparency of the cornea; but an abatement of the pain, and a sudden check of all the inflammatory symptoms. Hence, Mr. Wardrop was afterwards led to perform the operation, for the purpose of relieving the ophthalmy, as well as preventing opacity of the cornea, when the inflammation is attended with a fulness, prominence, and sense of distention in the eye, and cloudiness of the cornea. He says also, that in all cases in which there is the smallest quantity of pus in the anterior chamber, accompanied with inflammation, he would let out the contents of this part of the eye. Mr. Wardrop recommends the operation to be done with such a knife as is employed for the extraction of the cataract. The instrument is to be introduced into the cornea, so as to make an incision as broad as the blade, at the place where the knife is usually introduced in operating to extract the cataract. Then the aqueous humor flows out along the edges of the blade, as soon as this is turned a little on its own axis.—See *Edin. Med. and Surgical Journal, Jan.* 1807.

*Purulent Ophthalmy in Adult Subjects.*—The purulent eyes of infants are remarkably subject to ophthalmy. But there is another kind of purulent ophthalmy, to which adults are subject, and which is so generally represented by the best modern authors as arising from two very peculiar causes, viz. the suppression of a gonorrhœa, and the inadvertent application of gonorrhœal matter to the eyes, that the mention of the case cannot be prudently omitted.

The disease produces rather a swelling of the conjunctiva than of the eyelids. This tumefaction is followed by a discharge of a yellow, greenish matter, similar to what issues from the urethra in cases of clap. Heat and pain in the eyes; great aversion to light; and, in some instances, an appearance of hypopium in the anterior chamber, attend the malady. When the complaint proceeds from the second cause, it is said to be less severe.

As to *scrofulous ophthalmy*, no specific for scrofula being known, the treatment consists rather in preventing an aggravation, than attempting to effect the radical cure of the complaint.

2. *Of Opacities and Ulcers of the Cornea.*—Opacity of the cornea is one of the worst consequences of obstinate chronic ophthalmy. Scarpa distinguishes the superficial and recent state of the disease, from the albugo and leucoma, which are usually accompanied with inflammation, assume a clear pearl color, and affect the very substance of the cornea. The nebula, or slight opacity, now to be considered, is preceded by, and attended with, chronic ophthalmy. The iris and pupil can be seen through a kind of dimness; and, of course, the patient is not entirely bereft of vision. The veins of the conjunctiva, greatly relaxed by the protracted duration of chronic ophthalmy, become preternaturally turgid, irregular, and knotty; first in their trunks, then in their ramifications, near the union of the cornea with the sclerotica; and, ultimately, in their most minute branches, returning from the delicate lamina of the conjunctiva, spread over the anterior surface of the cornea. When this happens, a milky albuminous secretion begins to be superficially effused in the interspaces between the red streaks. The opaque specks thus produced may cover only a part, or the whole of the cornea.

The opacity of the cornea, sometimes occurring in violent ophthalmies, is essentially different from the nebula, and arises from a deep extravasation of coagulating lymph into the cellular texture of the cornea, or from an abscess between the layers of this membrane.

*Albugo and Leucoma* are also effects of severe acute ophthalmy, and consist of an extravasation of dense lymph into the very substance of the cornea. The disease is sometimes the consequence of an ulcer, or wound of this membrane. The first species, arising from the extravasation of lymph, is named albugo; while the term leucoma is particularly applied to the other form of the complaint. The recent albugo may sometimes be dispersed by the same treatment as is applicable to violent ophthalmy.

An ulcer of the cornea is commonly the consequence of the rupture of a small abscess, which not unfrequently forms beneath

the delicate layer of the conjunctiva, continued over the cornea, or in the very substance of the cornea itself, in consequence of violent ophthalmy. At other times, the ulcer is produced by the irritation of extraneous substances in contact with the eye, such as quick-lime, pieces of glass, &c. Little abscesses of the cornea ought never to be punctured, although they are slow in bursting. The matter which they contain is so viscid, that not a particle of it ever issues from an opening, and the wound exasperates the disease, increases the danger of opacity of the cornea, and often occasions another small abscess in the vicinity of that which has been punctured. The safest plan is to temporise, until the pustule spontaneously bursts; promoting this event by means of frequent fomentations, by bathing the eye with warm milk and water, and by applying to it emollient poultices. The ulcer of the cornea is of a pale ash-color; its edges are high and irregular; it creates acute pain; discharges a serous matter, and has a tendency to spread widely and deeply.

Scarpa has observed, that this character is not peculiar to ulcers of the cornea, it is common to all those sores which are situated where the skin is delicate, tense, and exquisitely sensible, as on the nipples of the mammæ, the glans penis, lips, apex of the tongue, &c. When ulcers of the cornea spread superficially, the transparency of the membrane becomes destroyed; when they proceed deeply, and penetrate the anterior chamber of the aqueous humor, this fluid escapes, and a fistulous opening may remain, or a prolapsus of a portion of the iris take place. If the ulcer be large, even the crystalline lens and vitreous humor may fall out; and, in short, a total destruction of the whole organ of sight be the result. The cicatrix of a large ulcer impairs the texture of the cornea so much, that the injury is irremediable.

3. *Of Pterygium and Encanthis.*—Pterygium is a term applied to the little, preternatural, reddish, ash-colored, triangular membrane, usually growing from the internal angle of the eye, about the caruncula lachrymalis, and extending over the cornea to the great impairment of vision. Although this kind of membrane generally proceeds from the inner canthus, it occasionally arises from the outer one, and, in some instances, from the superior and inferior hemisphere of the eye itself. Wheresoever it originates, it is a remarkable fact, that it is invariably of a triangular shape, the base of the triangle being towards the white of the eye, the apex towards the cornea, sometimes at a greater, sometimes at a less distance, from the axis of sight. In a few uncommon cases, two or three pterygia, of various sizes, are met with in the same eye, arranged with different interspaces around the circumference of the organ. Sometimes their points meet, and coalesce on the centre of the cornea, so as to completely abolish the functions of the eye.

Scarpa observes, with his usual accuracy, that between chronic varicose ophthalmy, with relaxation of the conjunctiva, the superficial opacity termed nebula, and the pterygium, the only difference is in the degree of the disease. All three consist of a varicose state of the vessels of th conjunctiva over a certain extent of this mem brane, together with a degree of relaxation of th tunic itself. In the chronic varicose ophthalm the preternatural magnitude and knottiness of th veins, and the relaxation of the conjunctiva, ar confined to the white of the eye; in the nebul the vessels of the conjunctiva are dilated an knotty, even over some part of the delicate laye of this membrane, covering the transparent por tion of the eye: in the pterygium, to the varicos state of the vessels on the surface of the corne is added a thickening of the lamina of the con junctiva, spread over this membrane.

A very peculiar feature of the pterygium is th facility with which it may be taken hold of wit a pair of forceps, and raised in a fold over th cornea. It is worthy of notice, however, tha sometimes the pterygium assumes a malignan cancerous nature, and then it has a bright re color like sealing-wax, easily bleeds whe touched, is firmly adherent to the cornea, an occasions lancinating pains, which extend ove the whole eye and temple. Scarpa recommend this case to be treated on the palliative plan but it seems questionable whether it might no be proper to attempt the total excision of th malady; if the trial should fail, we might the extirpate the eye, an operation truly horrible but one which would certainly become inevi table, if the malignant pterygium were allowe to increase, and one which can be avoided by n other means than an effort to extirpate the recen disease.

The *encanthis*, in the incipient state, is a small soft, red, and sometimes livid excrescence, grow ing from the caruncula lachrymalis, and neigh bouring semilunar fold of the conjunctiva. Ir the inveterate state its magnitude is considerable and its roots extend beyond the caruncul lachrymalis, along the lining of one or both eye lids. The complaint excites chronic ophthalmy prevents the complete closure of the eye, and b compressing and displacing the puncta lachry malia, obstructs the free passage of tears into th nose. The surface of the excrescence is at firs granulated like a mulberry; but, after the tumo has become large, only a part of its outside ha the above appearance, while the rest seems lik a smooth, whitish, ash-colored substance. I this advanced state, the body of the encanthi divides (to use Scarpa's figurative expression) like a swallow's tail, so as to form two elong ations, one of which extends along the inner sur face of the upper eyelid, the other along th inside of the lower one. As of pterygium, s there is a malignant species of encanthis, denote by its dull red color, bleeding tendency, lanci nating pain, excessive hardness, and very feti discharge. The same practical observations ap ply to this case, as to the cancerous pterygium.

4. *Of Staphyloma and Prolapsus of the Iris.*—Staphyloma is the name given to that disease o the eye, in which the cornea loses its natura transparency, rises above its proper level, an even projects between the eyelids, in the form o a whitish, pearl-colored tumor, which is attende with total loss of sight. The malady commonl results from some violent species of ophthalmy

particularly that which is termed purulent, and affects children, and that which is consequent to the small-pox. As Scarpa observes, the staphyloma is one of the most serious diseases to which the eyeball is subject; for, to the total and irremediable loss of sight, are added all the evils which necessarily result from the protuberance of the cornea in advanced cases. The inability of closing the eyelids; the exposure of the eyeball to the contact of the air, and extraneous matter suspended in it; the friction of the eyelashes against the tumor; the incessant flux of tears down the subjacent cheek; render the eye painful and inflamed; sympathetically induce ophthalmy in the sound one; and cause ulceration both on the diseased part of the eye, and on the lower eyelid and cheek.

*Prolapsus* of the iris is also denominated by some writers staphyloma. Sometimes, when the aqueous humor has escaped through an ulcer, or wound of the cornea, the iris is pressed forward by the humors situated behind it, until a portion of it protrudes from the eye, at the same opening through which the aqueous humor made its escape. The little tumor is of the same color as the iris, viz. brown, or grayish, and is surrounded at its base by an opaque circle of the cornea. If we reflect a little on the delicate structure of the iris, on the great quantity of blood-vessels which enter it, and the numerous nervous filaments which are distributed to it, we shall easily conceive the nature and severity of those symptoms which are wont to attend this disease, how small soever the portion of the iris projecting from the cornea may be, even when not larger than a pin's head. Pain, similar to what would arise from something pricking the eye; an oppressive sense of tightness in the whole eyeball; inflammation of the conjunctiva and eyelids; a copious effusion of tears; and an absolute inability to endure the light, are the symptoms which successively follow this complaint. The pupil deviates from the centre of the iris, towards the seat of the prolapsus, and assumes an oval shape. In very old cases the protruded portion of the iris seems frequently to become less sensible and irritable, so that patients do not experience inconvenience equal to the above account.

5. *Of Cataract.*—When opacity gradually affects the crystalline lens, or its capsule, the species of blindness thence resulting is denominated a cataract. The first effect of an incipient opacity is a mist before the eyes, surrounding every object, and afterwards gradually increasing so much in density as to render things quite invisible. The opacity behind the pupil increases in proportion as the cloudiness in vision augments. As the lens is thick at its centre, and thin at its edge, the incipient opacity, when viewed externally, always seems the greatest in the middle of the pupil; while the circumference of the lens appears like a black ring, surrounding the white nucleus of the crystalline. Some rays of light are capable of penetrating the thin margin of the lens in its most opaque state; and hence patients with cataracts are almost always able to distinguish light from darkness, and, in the early stage of the complaint, discern objects best when these are a little on one side of the axis of vision, and not immediately opposite the eye. Hence, also, such patients see better in a moderate, than a brilliant light, which makes the pupil contract over the thin circumference of the lens. When the opaque lens is either more indurated than in the natural state, or retains a moderate degree of consistence, the case is termed a firm or hard cataract.

Mr. Pott has explained, that an opaque lens is very rarely firmer than, or even so firm as, a healthy one; and both this eminent surgeon and Richter make it appear probable, that the harder a cataract is, the thinner and smaller it becomes. The latter states, that a firm cataract usually presents either an ash-colored, a yellow, or a brownish appearance. The interspace between the cataract and pupil is very considerable. The patient very distinctly discerns the light, and can even plainly perceive large bright objects. In the dilated state of the pupil, a black circle, surrounding the lens, is very perceptible. The motions of the pupil are free and prompt; and the anterior surface of the cataract appears flat, without the least degree of convexity. When the substance of the lens seems to be converted into a whitish, or other kind of fluid, lodged in the capsule, the case is denominated a milky, or fluid cataract. According to Richter, this species of the malady has usually a white appearance, while irregular spots and streaks, different in color from the rest of the cataract, are often observable on it. These are apt to change their figure and situation, when frequent and sudden motions of the eyes occur, or when these organs are rubbed or pressed. The lower half of the pupil seems more opaque than the upper one. The crystalline lens, as it loses its firmness, commonly acquires an augmented size. Hence the fluid cataract is thick, and the opacity close behind the pupil. Sometimes one can perceive no space between the cataract and margin of the lens. In advanced cases the pupil is usually very much dilated, and the iris moves very slowly and inertly, in consequence of the cataract touching this membrane, and impeding its action. Patients, who have milky cataracts, usually distinguish light from darkness very indistinctly, and sometimes not at all; partly because the cataract, when bulky, lies so close to the iris that few or no rays of light can enter between them into the eye; and partly because the fluid cataract always assumes a globular form, and consequently has no thin edge, through which the rays of light can penetrate.

When the opaque lens is of a middling consistence, neither hard, nor fluid, but about as consistent as a thick jelly, or curds, the case is termed a soft, or caseous cataract. As the lens softens in this manner, it commonly grows thicker and larger, even acquiring a much greater size than that of the fluid cataract. Hence, this species of the malady impedes the motion of the pupil, even more considerably than the latter sort of case.

The only other species of the disease, necessary to be noticed, is the secondary membranous cataract, which is an opacity of the anterior or posterior layer of the crystalline capsule, taking place after the lens itself has been removed from

this little membranous sac by a preceding operation. All cataracts may be complicated with other diseases of the eyes, chronic ophthalmy, lippitudo, gutta serena, adhesion of the opaque lens to the iris, &c.

6. *Of Hypopium, Dropsy and Cancer in the eye.*—Hypopium is an accumulation of a glutinous, yellowish fluid, like pus, in the anterior chamber of the aqueous humor, and frequently also in the posterior one, in consequence of violent ophthalmy. The symptoms, exciting apprehensions of an hypopium, are the very same which occur in the highest stage of violent acute ophthalmy, viz. prodigious tumefaction of the eyelids; redness and swelling of the conjunctiva, as in chemosis; burning heat and pain in the eye; pains in the eyebrow and nape of the neck; fever; restlessness; aversion to the faintest light, and a contracted state of the pupil. As soon as the hypopium begins to form, a yellowish, semilunar streak makes its appearance at the bottom of the anterior chamber, and, regularly as the glutinous fluid is secreted, it increases in all dimensions, and gradually obscures the iris, first, its anterior part, next where it forms the pupil, and lastly, its whole circumference. While the inflammatory stage of the ophthalmy lasts, the hypopium never fails to enlarge; as soon as this stage ceases, and the ophthalmy becomes connected with real weakness, the hypopium leaves off increasing, and from that moment is disposed to diminish.

When the secerning extremities of the arteries, and the minute mouths of the absorbent vessels of the eye, do not act in their naturally reciprocal manner, the organ may become distended with a morbid redundance of an aqueous secretion. This malady constitutes what is termed dropsy of the eye, and is at first attended with great weakness, and afterwards with total loss of sight.

Scarpa, who has had many opportunities of dissecting dropsical eyes, is inclined to believe, that, in the generality of instances, the disease chiefly depends on a diseased secretion of the vitreous humor, and also, occasionally, on a morbid alteration of the alveolary membrane, by which this humor is produced. The eye affected assumes an oval shape, terminating in a point on the cornea; then, as the organ enlarges in all dimensions, it projects from the orbit in such a manner, that it causes immense deformity, and prevents the closure of the eye-lids.

The disease is sometimes preceded by blows on the eye, or adjoining temple; sometimes, by an obstinate internal ophthalmy. In other instances it is preceded by no inconveniences, except an uneasy sensation of tumefaction and tension of the orbit, a difficulty of moving the eye ball, and a considerable impairment of sight. When the eye has assumed an oval figure, and the anterior chamber has become preternaturally capacious, the iris seems situated backward, in an unnatural degree, and tremulates in a very singular way, on the slightest motion of the eyeball. The pupil remains dilated in every degree of light, while the crystalline is sometimes discolored from the very beginning of the disease, and sometimes does not become opaque, till the affection has arrived at its highest pitch. While the eye is not considerably enlarged, and the crystalline is not deeply opaque, the patient can usually distinguish the outlines of objects and brilliant colors. But, when the eye has acquired a larger volume, and the whole crystalline has become opaque, the retina becomes completely paralytic, probably, from the excessive distention which it suffers. In the last stage of the disease, when the dropsical eye projects from the orbit, so as not to admit of being covered by the eyelids, to the inconveniences already enumerated, others associate themselves, arising from the dryness of the eye; the contact of extraneous bodies; the friction of the eyelashes; the very viscid secretion from the eyelids; the ulceration of the lower eyelid, and even of the eye itself. Hence, the advanced stage of dropsy of the eye induces violent ophthalmies, followed by ulceration and a total destruction of the organ.

*Carcinoma* is said to make its appearance in this situation in three forms. Sometimes the eyeball becomes irregular and knobby, and swells to the size of an apple; the sight is gradually lost; the blood-vessels in the white of the eye enlarge; and the whole external and internal structure of the organ becomes so altered that the part resembles a piece of flesh, and no vestiges of its original organisation remain. Sometimes a portion of the cornea is still externally visible. Internally may sometimes be discerned a small aperture, through which may be distinguished the remains of the vitreous humor, and of the choroid coat. In some instances, the eyeball is ulcerated and emits a fetid discharge. In others, there is not the smallest appearance of ulceration, and the eyeball resembles a piece of firm flesh. The patient commonly experiences in the eye, from the first, considerable burning, and, at last, violent darting pains, extending over one side of the head. This is the most frequent description of cancer of the eye. Sometimes excrescences form on the anterior surface of the eye, especially on the transparent cornea, and frequently admit of being radically cured by the knife, caustics, or ligature. But, occasionally, they regularly grow again after the employment of these means, becoming broader, more malignant, and even cancerous, and, at length, changing into a spongy fungus, which is very painful, covers the whole anterior surface of the eye, and renders extirpation indispensable. This is the second sort of cancer of the eye. On several occasions, ulcers form on the front of the eyeball, which, though generally curable by proper means, sometimes are exceedingly inveterate, entirely destroying the eyesight, and becoming so malignant as to obtain the appellation of cancer. This is the third species of cancer of this organ. On the subject of extirpation of the eye, sometimes the only resource of surgeons in this case, see SURGERY.

EYE, a market town of Suffolk, built on a kind of island, surrounded by a brook, near the borders of Norfolk, in the road between Ipswich and Norwich. It was incorporated by king John; has two bailiffs, ten principal burgesses, twenty-four common counsellors, a recorder, and a town clerk. The chief manufacture is bone-lace and spinning. It has a large handsome church; and

near it are the ruinous walls of an ancient castle and monastery. The market is on Saturday, the fair on Whit-monday. It formerly sent two members to parliament: since the passing of the reform bill it sends only one. It is twenty miles and a half north of Ipswich, and ninety N. N. E. of London. The greatest part of the town belongs to earl Cornwallis, who is lord of the manor, from whence he receives the title of baron.

EYE OF A BLOCK, in naval affairs, that part of the rope-strap which is fastened to some necessary place in the ship: the strap is a sort of wreath, or rope formed into a ring, and fixed round the block for the double convenience of strengthening the block and fastening it in any place where it is wanted.

EYEMOUTH, a town of Berwickshire at the mouth of the Eye. The town is a borough of barony, of which Mr. Wedderburn is proprietor and superior. About the beginning of the eighteenth century, Eyemouth was a small fishing village, which afforded a retreat for smugglers; but shortly after the Union, that pernicious trade being much checked, the gentlemen of the county took advantage of the excellent natural harbour formed by the river Eye; and in 1750 a new pier was erected on the west side of the harbour, and in 1770 another on the east side; in consequence of which the trade has considerably increased. The coast abounds with fish, and many fishing boats are constantly employed. It has fairs in June and October, and lies nine miles north by west of Berwick.

EYLAU, PRUSSIAN, a town of Prussia, chiefly remarkable as the scene of the first successful resistance of the Russians to the power of Buonaparte on his invasion of that country. It is twenty miles south of Konigsberg.

Beningsen, the Russian commander, after retreating before the French for six days, had promised to give battle to them on this spot: but the ground was ultimately chosen with a view to the preservation of the city of Koningsberg. The length of the Russian position was two miles; partly flanked by woods, but, on the whole, elevated and exposed. The French took post nearly parallel, but on higher ground, so that their artillery could command the Russian position. The French had likewise the superiority in numbers, the Russians not exceeding 60,000 men. On the eve of the battle, there was a sanguinary struggle for the town of Eylau, which remained in possession of the French. The cannonade began next day at dawn, and was at first conducted with greater effect on the part of the French. The marshy ground between the armies now appearing easily passable over the ice, Buonaparte ordered two large columns to move forward, the one against the centre, the other on the right flank of the Russians; but, after advancing 300 yards, the havoc of the Russian artillery was so great as to break their order, and they returned in confusion. A subsequent effort against the Russian left, was equally unavailing, the Russians driving back their opponents with the bayonet.

Buonaparte's general attack was now ordered. Calculating that Davoust, whom he had detached to take the Russians in the rear, would arrive at his station towards noon, Buonaparte directed a movement of his army in six separate columns, against the Russian line: and a heavy fall of snow concealed the arrangement. When they had come upon the Russian line, Beningsen, aware of the importance of the moment, made his own reserve advance, join themselves to the main body, and rush forward, with united strength, to charge the enemy. The French were shaken, gave way, and all efforts to rally them became ineffectual. Their cavalry attempting to turn the fortune of the day by desperate charges, were cut up in great numbers. Scarcely, however, had the Russians effected this repulse, when they were ordered to face about, a numerous corps appearing on their left, and threatening their rear. This was the corps of Davoust, who had been retarded by the wretched state of the roads. The Russian main body was drawn back from the field of battle to meet him; and a Prussian corps under general Lestocq having, after a most difficult march, reached the scene of action, advanced also to attack the French. Their number did not exceed 6000; but they were admirably commanded by Lestocq, and the Russian left wing affording them support, Davoust was repulsed with very heavy loss. Night now came on, and Buonaparte recalled him. Had the Russians been in a condition to make an attack the next day, their success, it is thought, would have been certain; but their ammunition was expended, and their men were exhausted. Beningsen, apprehensive for the eventual safety of Koningsberg, now, therefore, took the determination of retreating, contrary to the wish of his generals. The Russians acknowledged a loss of nearly 20,000 men in killed and wounded, and estimated that of the French to exceed 30,000. Buonaparte remained for some time at this place, but finding that the Russian cavalry well protected the surrounding country, and that he could make no effectual progress against so obstinate an enemy, he retired in the direction of Dantzic.

EYOT, *n. s.* Sax. eᵹᵹað, an island. A little island.

It seems just, that the *eyots*, or little islands, arising in any part of the river, shall be the property of him who owneth the piscary and the soil. *Blackstone.*

EYNAPOOR, or AINAPOOR, a town in the province of Bejapoor, Hindostan, belonging to the Mahrattas. It is twelve miles south-east from Merritch. This is a town of some size, in which are several Mahommedan families, who subsist on the produce of charitable lands.

EYRE, *n. s.* Fr. *eyre;* Lat. *iter.* The court of justices itinerants; and justices in eyre are those only, which Bracton in many places calls justiciarios itinerantes. The eyre also of the forest is nothing but the justice-seat, otherwise called; which is, or should, by ancient custom, be held every three years by the justices of the forest, journeying up and down for that purpose. (Cowel).

EYRY, *n. s.* From Teut. *ey*, an egg. The place where birds of prey build their nests and hatch.

But I was born so high,
Our *eyrie* buildeth in the cedar's top,
And dallies with the wind, and scorns the sun.
*Shakspeare.*

The eagle and the stork,
On cliffs and cedar-tops their *eyries* build. *Milton.*

Some haggard hawk, who had her *eyry* nigh,
Well pounced to fasten, and well winged to fly.
*Dryden.*

Forth from his *eyry* roused in dread,
The ravening eagle northward fled. *Collins.*

So, borne on sounding pinions to the west,
When tyrant-power had built his eagle nest;
While from his *eyry* shrieked the famished brood,
Clenched their sharp claws, and champed their beaks for blood. *Darwin.*

EZEKIEL, the third of the greater Prophets, was the son of Buzi, and of the sacerdotal race. He is said to have been a native of Sarera, and to have been carried away captive to Babylon with Jehoiachim, king of Judah, A.M. 3406. He settled, or was placed, with many others of his captive countrymen, on the banks of the Chebar, a river of Mesopotamia; where he was favored with the divine revelations which are described in this book. He is supposed to have prophesied during a period of twenty-one years. He began to deliver his prophecies about eight or ten years after Daniel, in the fifth year of Jehoiachim's captivity; and, as some have supposed, in the thirtieth year of his age. The author of Ecclesiasticus says of him, that 'he directed them who went right;' which may be considered as a merited encomium on the industry with which he endeavoured to instruct and guide his countrymen to righteousness. He is reported by some writers to have presided in the government of the tribes of Gad and Dan in Assyria; and, among other miracles, to have punished them for idolatry by a fearful destruction produced by serpents. In addition to these popular traditions it is reported, that his countrymen were so incensed by his reproaches as to put him to a cruel death. In the time of Epiphanius it was generally believed that his remains were deposited in the same sepulchre with those of Shem and Arphaxad, which was situated between the river Euphrates and that of Chaboras, in the land of Maur; and it was much resorted to, not only by the Jews, but also by the Medes and Persians: who reverenced the tomb of the prophet with a superstitious devotion. The authenticity of Ezekiel's book will admit of no question. He represents himself as the author in the beginning and other parts of it, and justly assumes the character and pretensions of a prophet, as such he has been universally considered.

St. Jerome remarks, with great truth, that the visions of Ezekiel are sometimes very mysterious and of difficult interpretation, and that they may be reckoned among the things in Scripture which are 'hard to be understood.' Ezekiel himself, well aware of the mysterious character of those representations which he beheld in vision, and of the necessary obscurity which must attend the description of them to others, humbly represented to God that the people accused him of speaking darkly 'in parables.' It appears to have been God's design to cheer the drooping spirits of his people, but only by communicating such encouragement as was consistent with a state of punishment, and calculated, by indistinct intimations, to keep alive a watchful and submissive confidence. For this reason, perhaps, were Ezekiel's prophecies, which were revealed amidst the gloom of captivity, designedly obscure in their nature; but, though mysterious in themselves, they are related by the prophet in a plain and historical manner. He seems to have been desirous of conveying the strong impressions which he received, as accurately as they were capable of being described.

'The book of Ezekiel,' says Bishop Gray, 'is sometimes distributed, by the following analysis, under different heads. After the first three chapters, in which the appointment of the prophet is described, the wickedness and impending punishment of the Jews, especially of those remaining in Judæa, are represented under different parables and visions to the twenty-fourth chapter, inclusive. From thence to the thirty-second chapter, the prophet turns his attention to those nations who had unfeelingly triumphed over the Jews in their affliction; predicting that destruction of the Ammonites, Moabites, and Philistines, which Nebuchadnezzar effected; and particularly, he foretells the ruin and desolation of Tyre and of Sidon, the fall of Egypt, and the base degeneracy of its future people, in a manner so forcible, in terms so accurately and minutely descriptive of their several fates and present condition, that nothing can be more interesting than to trace the accomplishment of these prophecies in the accounts which are furnished by historians and travellers. From the thirty-second to the fortieth chapter, Ezekiel inveighs against the hypocrisy and murmuring spirit of his captive countrymen: encouraging them to resignation by promises of deliverance, and by intimations of spiritual redemption. In the last two chapters of this division, under the promised victories to be obtained over Gog and Magog, he undoubtedly predicts the final return of the Jews from their dispersion in the latter days; with an obscurity, however, that can be dispersed only by the event. The nine last chapters of this book furnish the description of a very remarkable vision of a new temple and city; of a new religion and polity, under the particulars of which is shadowed out the establishment of a future universal church. Josephus says, that Ezekiel left two books concerning the captivity; and the author of the Synopsis attributed to Athanasius, supposes that one book has been lost; but, as the last nine chapters of Ezekiel constitute in some measure a distinct work, probably Josephus might consider them as forming a second book.'

It deserves to be remarked, that we are informed by Josephus, that the prophecy in which Ezekiel foretold that 'Zedekiah should not see Babylon, though he should die there,' was judged by that monarch to be inconsistent with that of Jeremiah, who predicted that 'Zedekiah should behold the king of Babylon and go to Babylon But both were exactly fulfilled; for Zedekiah did see the king of Babylon at Riblah, and then, being deprived of his eyes, he was carried to Babylon, and died there. From this account it

appears, that Ezekiel's prophecies were transmitted to Jerusalem, as we know that Jeremiah's were sent to his countrymen in captivity; an intercourse being kept up, especially for the conveyance of prophetic instruction, for aught that might console misery, or awaken repentance; and it was probably on the ground of this communication, that the Talmudists supposed that the prophecies of Ezekiel were arranged into their present form, and placed in the canon by the elders of the great synagogue.'

The style of Ezekiel is characterised by Bishop Lowth as bold, vehement, and tragical; as often worked up to a kind of tremendous dignity. His book is highly parabolical, and abounds with figures and metaphorical expressions. 'Ezekiel,' says the author before quoted, 'may be compared to the Grecian Æschylus; he displays a rough but majestic dignity; an unpolished though noble simplicity; inferior, perhaps, in originality and elegance, to others of the prophets; but unequalled in that force and grandeur for which he is particularly celebrated. He sometimes emphatically and indignantly repeats his sentiments; fully dilates his pictures; and describes the adulterous manner of his countrymen under the strongest and most exaggerated representations that the licence of the eastern style would admit. The middle part of the book is in some measure poetical; and contains even some perfect elegies; though his thoughts are in general too irregular and uncontrolled to be chained down to rule, or fettered by language.'

EZRA, or ESDRAS, a Jewish priest, in the direct line from Aaron, and author of the book that bears this name in the Bible, succeeded Zerubbabel in the government of Judea, A. M. 3546, and was in commission as such about twelve years; at the expiration of which he seems either to have returned to Babylon, or retired to a private station in Judea.

'Some critics indeed,' says Bishop Gray, 'have pretended that the first six chapters must have been written by a person more ancient than Ezra, because Ezra is said, in the seventh chapter, to have gone up from Babylon after the events described in the first six chapters, in the time of Artaxerxes Longimanus; whereas, in the fifth chapter, the author has been thought to speak of himself as present at Jerusalem, in the time of Darius Hystaspes: if this be not a mistake, Ezra may perhaps be supposed to have accompanied Zerubbabel in the first return from the captivity; and might have been again sent up to Babylon to counteract the representations of those who opposed at the Persian court the rebuilding of the city and temple; and the account of his departure, which is given in the seventh chapter, perhaps refers only to his going up with that commission and power which he received from Artaxerxes. But, whether Ezra were or were not at Jerusalem at the time when this answer is supposed to have been made to Tatnai, he may well be conceived, either as copying a public record of the transaction, or as relating a speech of the Jews, to have used the expression of We said unto them, meaning by we, his countrymen; which is surely no uncommon mode of speaking. Such objections are very futile; and there is no reason to question the authenticity of any part of the book, which from the highest antiquity has been attributed to Ezra; who certainly at least digested it; and probably towards the end of his days.'

This book begins with an account of God's having disposed Cyrus, either by positive injunction, or by discovering to him his long-predicted designs, to promote the rebuilding of the city and temple of Jerusalem. It relates the accomplishment of some illustrious prophecies in the release which that monarch granted in the first year of his reign over Babylon; and in the return of the Jews to their own country after a captivity of seventy years, A. M. 3468. We then are presented with a list of the leaders and numbers of the captives who returned under Zerubbabel, and perceive how fatally the nation had been diminished and brought low by successive defeats and dispersions. We contemplate the picture of a harassed people restored from captivity, and returning to their country, which had long lain desolate. We behold them erecting a temporary altar and service, and laying the foundation of their temple. Afterwards are described the lamentations of those who remembered the magnificence of Solomon's building; the opposition excited by the Samaritans and others, whose assistance had been rejected; the interruption occasioned by their intrigues; and, at last, the finishing and dedication of the temple about A. M. 3489, and the celebration of the passover. Ezra then relates his return with his companions to Jerusalem; confesses the disobedience of the people to God's laws, in intermarrying with the Gentile nations of the land; describes his own pious and conciliatory prayer; the repentance of the people, and their separation from their wives and children, who, not being of the holy seed, might, if suffered to intermingle with the Jews, have rendered uncertain the accomplishment of the promises; and he concludes with an enumeration of those who had transgressed: stigmatising, with impartial indignation, the names of even the priests and rulers who had offended in this important violation of the law. The history contains a period of about seventy-nine years: from A. M. 3468, when Cyrus became master of Persia, to A. M. 3547, when Ezra effected the reform described in the last chapter of his book; for between the dedication of the temple, and the departure of Ezra from Babylon in the seventh year of the reign of Artaxerxes Longimanus, is a period of fifty-seven or fifty-eight years; which this book passes over in silence, only mentioning that the Jews had during that time intermixed with the Gentiles.

Ezra is written in Chaldee from the eighth verse of the fourth chapter to the nineteenth verse of the sixth chapter, and from the beginning of the seventh chapter to the twenty-seventh verse; for as this part of the work contains chiefly letters, conversation, and decrees uttered in that language; it was consistent with the fidelity of the sacred historian, to describe the very words which were used; especially as the people re-

cently returned from the captivity were familiar, and perhaps more conversant with the Chaldee than even with the Hebrew tongue; and it was probably about this time that the Chaldee paraphrases began to be used; for it appears by Nehemiah's account, that all could not understand the law, which may mean that some of them had forgotten the Hebrew during their dispersion in the captivity.

Ezra appears to have been particularly well skilled in the law, to have given much attention to the study of the Scriptures, and to have been well versed in the interpretation of them. He styles himself a ready scribe, and professes to have prepared himself to instruct the people in the statutes of God: the tradition, therefore, of his having made a collection of the sacred writings is extremely probable. We know, indeed, from Josephus, that the Jewish priests, after every important war, were accustomed on the establishment of peace, both at home and abroad, publicly to ascertain, recognise, and copy out the registers of the priesthood; by which we must either understand the Scriptures, or believe that the same practice prevailed as to them. Ezra, therefore, may well be supposed to have published a correct edition, after the re-establishment of the Jews; and probably with the assist[illegible] of the great synagogue, which particularly flourished in the time of Artaxerxes Longimanus; not that there is any reason to imagine that the sacred books were lost during the captivity; as some have absurdly conceived from the fabulous relation of a pretended burning of the law, and of the restoration of the Scriptures by divine revelation, which account is given only in the apocryphal book of Esdras: a work of little or no authority. The copies of the law were too much reverenced to be lost; and Daniel we know was in possession of one during the captivity. He likewise quotes the prophecies of Jeremiah; and probably other persons had copies of the Scriptures, many of them being favored by the conquerors; and if the sacred vessels of the temple were so carefully preserved, we ma[y] well conceive that the authentic manuscripts o[f] the Hebrew Scriptures were safely deposited a[t] Babylon; and, perhaps restored to Zerubbabel or Ezra, on their return to Jerusalem. But wherever preserved, Ezra certainly produced th[e] Law, and read it to the people; and the othe[r] books of scripture were collected by him an[d] Nehemiah, or by the great synagogue.

Besides the books which are ascribed to Ezra in the apocryphal part of our Bible, there hav[e] been spurious constitutions, benedictions, an[d] prayers attributed to him; as likewise a revela tion, a [illegible] and a prophecy relative to th[e] Roman [illegible]; together with a calendar o[f] pretended [illegible] and unlucky days, none o[f] which des[illegible]

Justin [illegible] very re markable [illegible] found i[n] the book [illegible] of Ari anism, p. 30[illegible]. vi. 19–22, or between the [illegible] verses; and h[e] contends for its genuineness. It is thus trans lated:—'And Ezra said unto the people, thi[s] passover is our saviour and our refuge; and i[f] ye shall understand and ponder it in your heart that we are about to humble him in this sign, an[d] afterwards shall believe on him, then this plac[e] shall not be made desolate for ever, saith th[e] Lord of hosts. But if ye will not believe on him nor hear his preaching, ye shall be a laughing stock to the gentiles.' Dr. Adam Clarke also i[s] disposed to believe this passage authentic (Disc on the Eucharist, p. 83); and L'Enfant think[s] that St. Paul alludes to it expressly 1 Cor. [illegible] But Dr. Grabe, Thirlby, and archbishop M[illegible] (Discourses on the Atonement, i. 306,[illegible] doubt its genuineness; and Dr. Clarke do[es] refer to it in his Commentary on 1 Cor. v. 7, o[r] Exod. xii. 8. No Hebrew copy of the clause i[s] found, nor is it in any copy of the Septuagi[nt] version. The Greek passage may be found i[n] Justin Martyr, Thirlby, pp. 292-3, and is dis cussed at length by Dr. Magee.

END OF VO[illegible]


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# BREWING.

*Mash Tun*

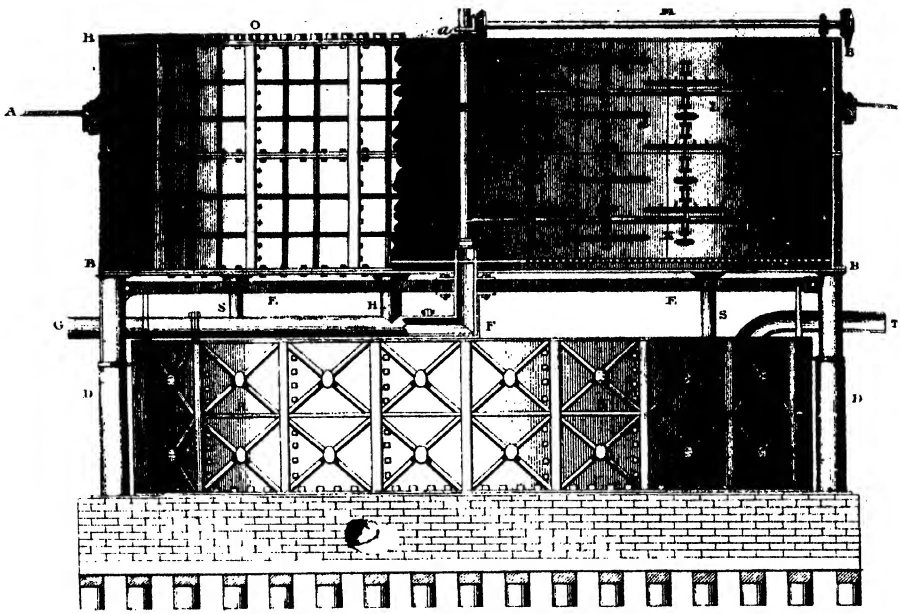
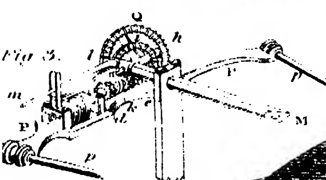



*Fig. 3.*

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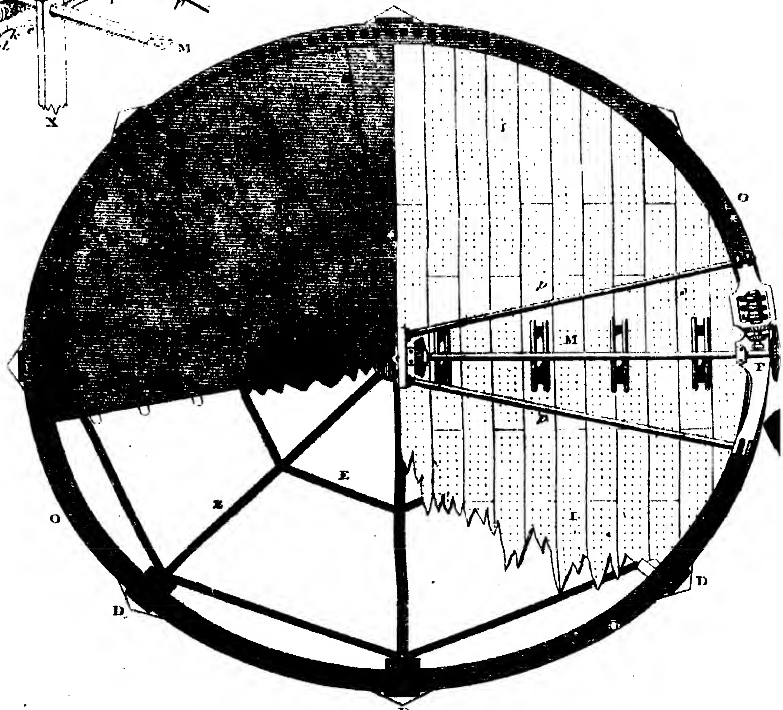


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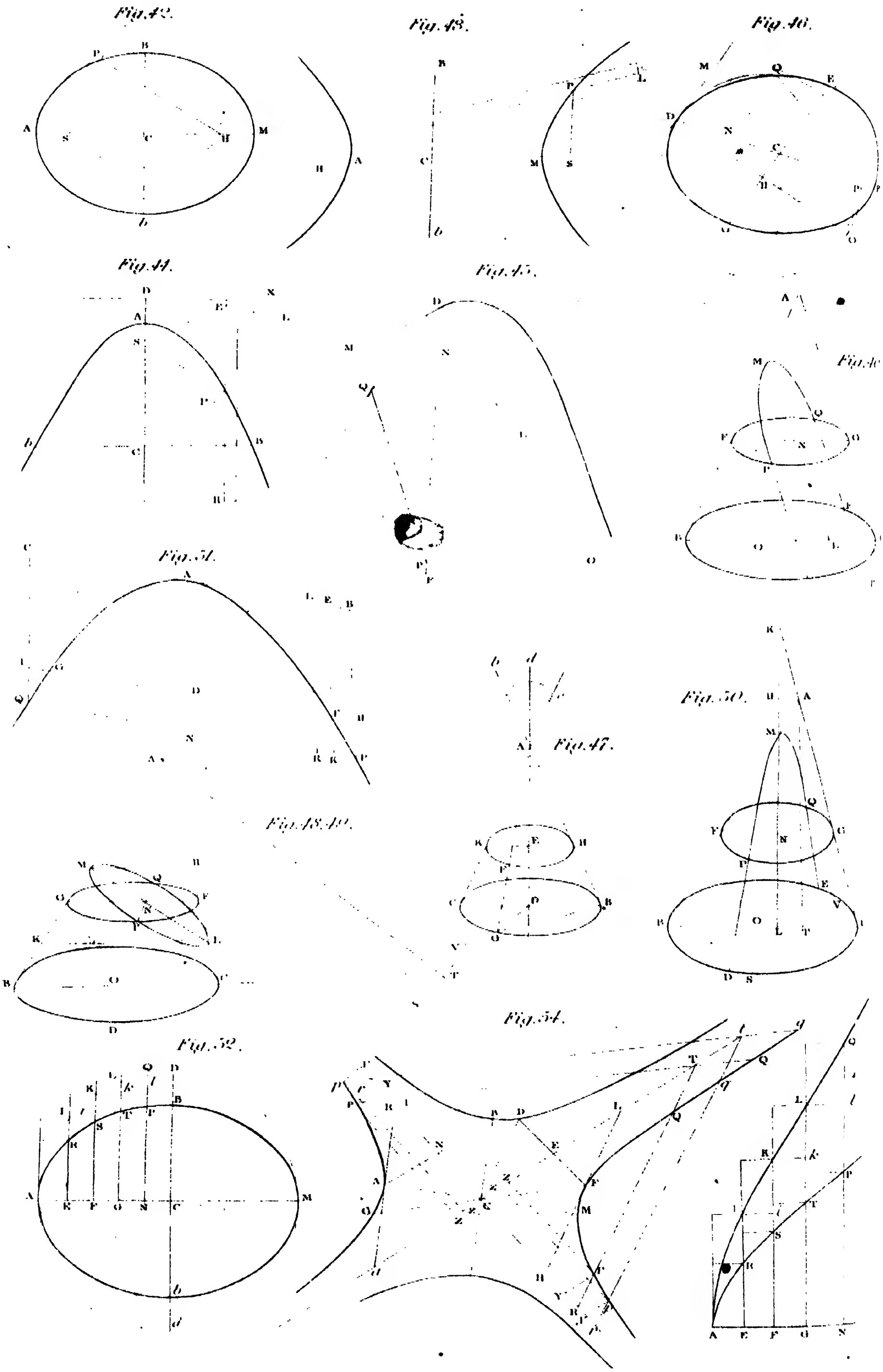
# CONIC SECTIONS,



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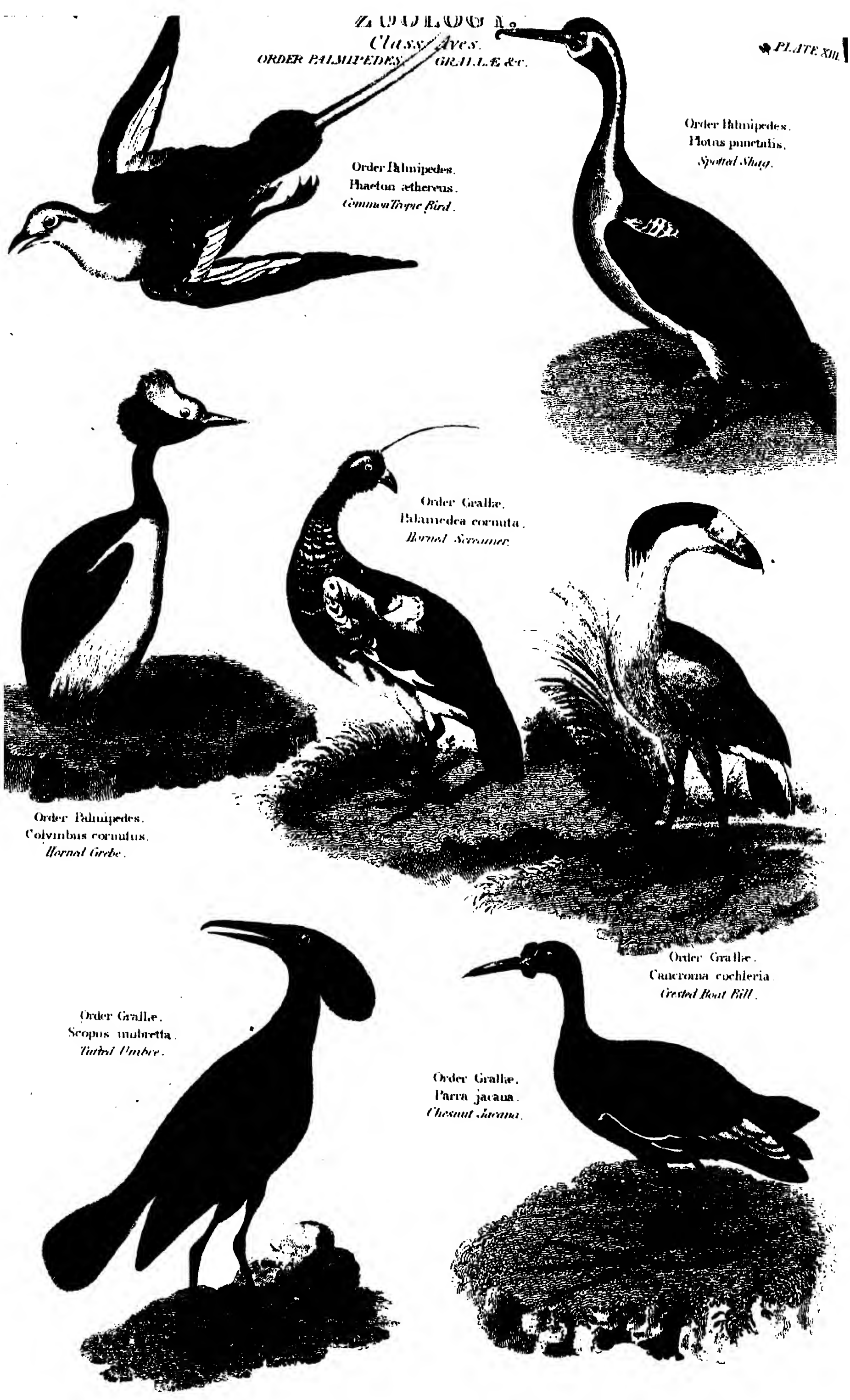


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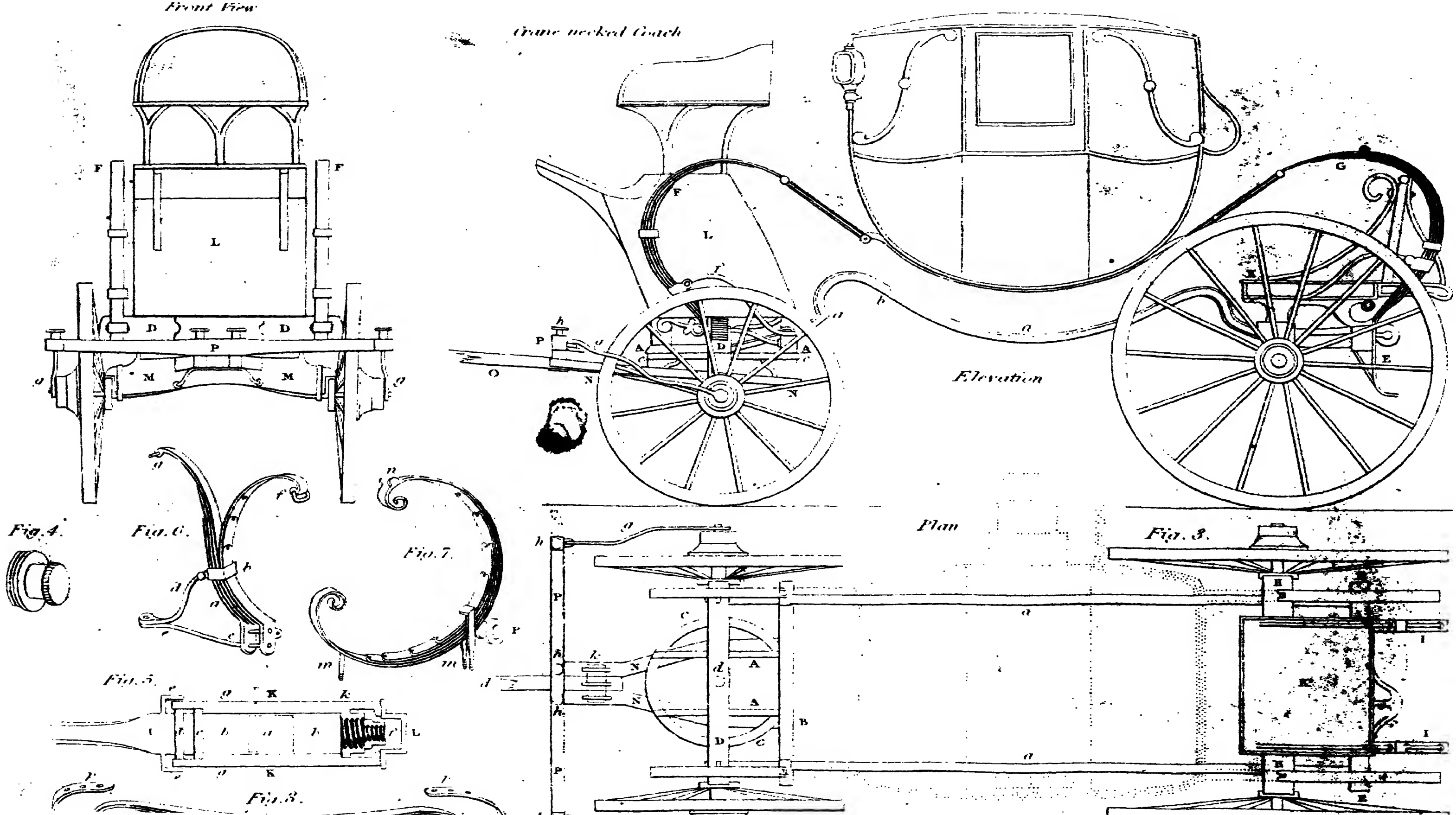

Front View
Crane necked Coach
Elevation
Plan
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.

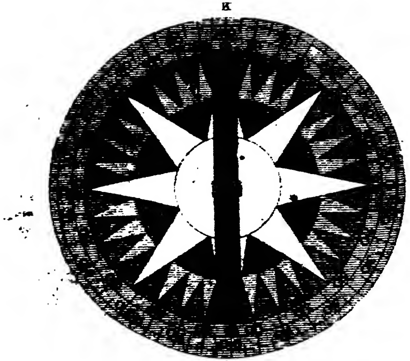
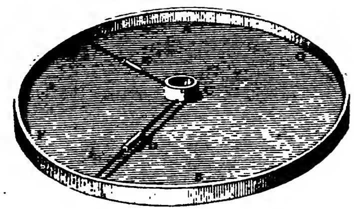
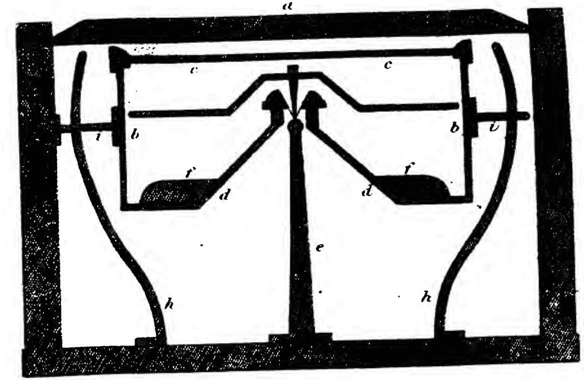



Fig. 2



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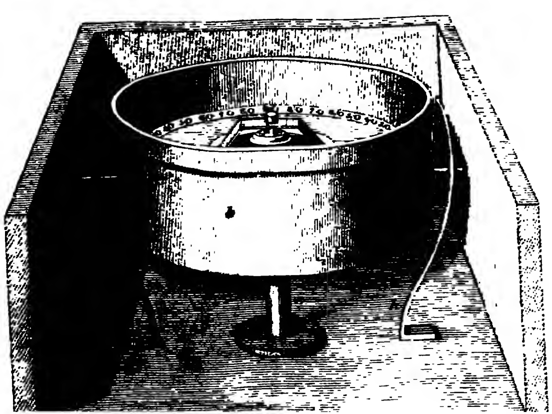
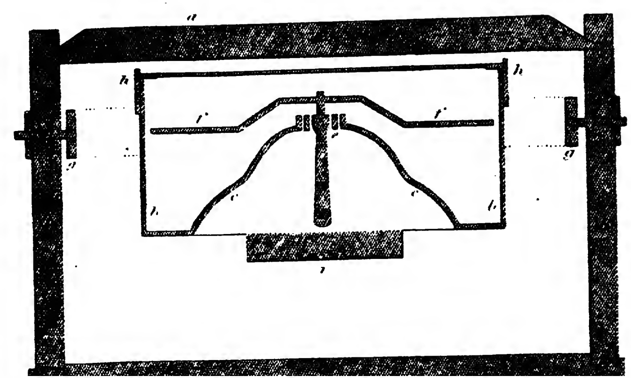


Fig. 3.


Fig. 6.



# ZOOLOGY.

*Class Aves.*

***ORDER PALMIPEDES, GRALLÆ &c.***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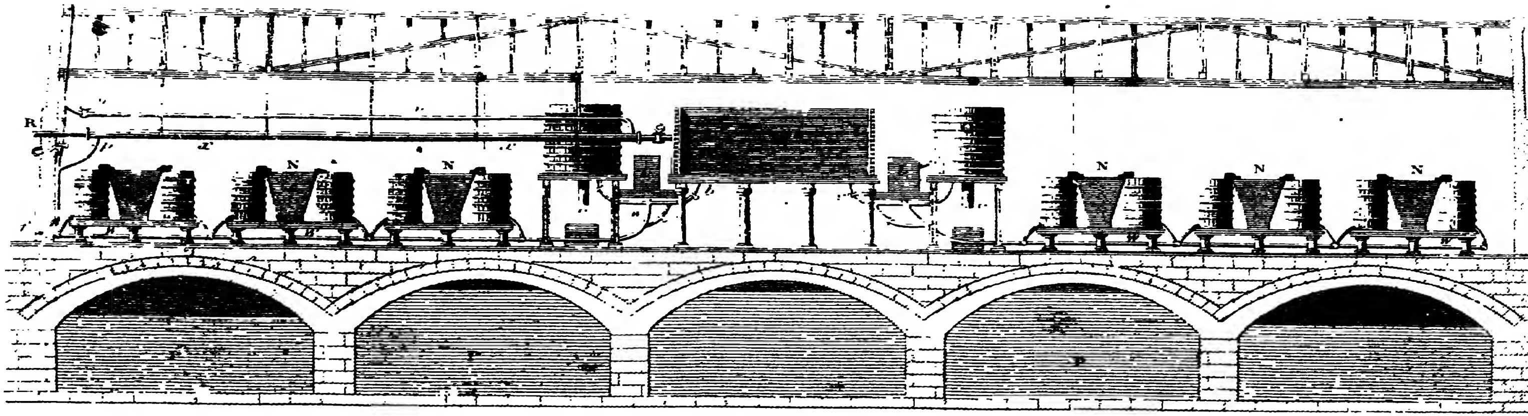


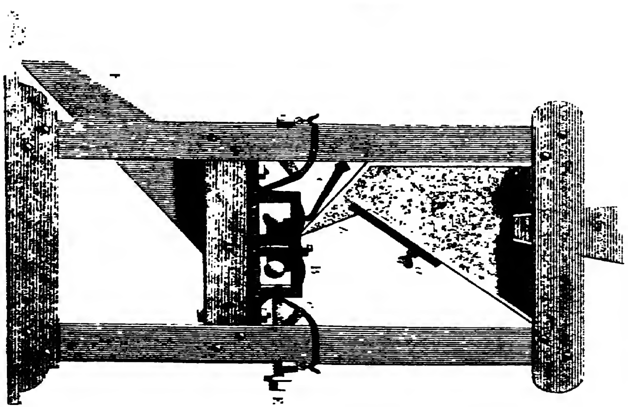

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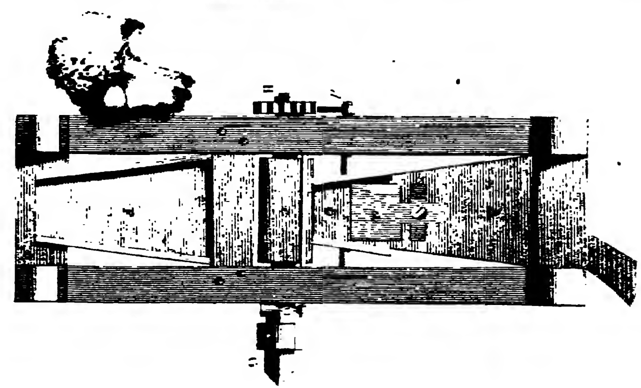

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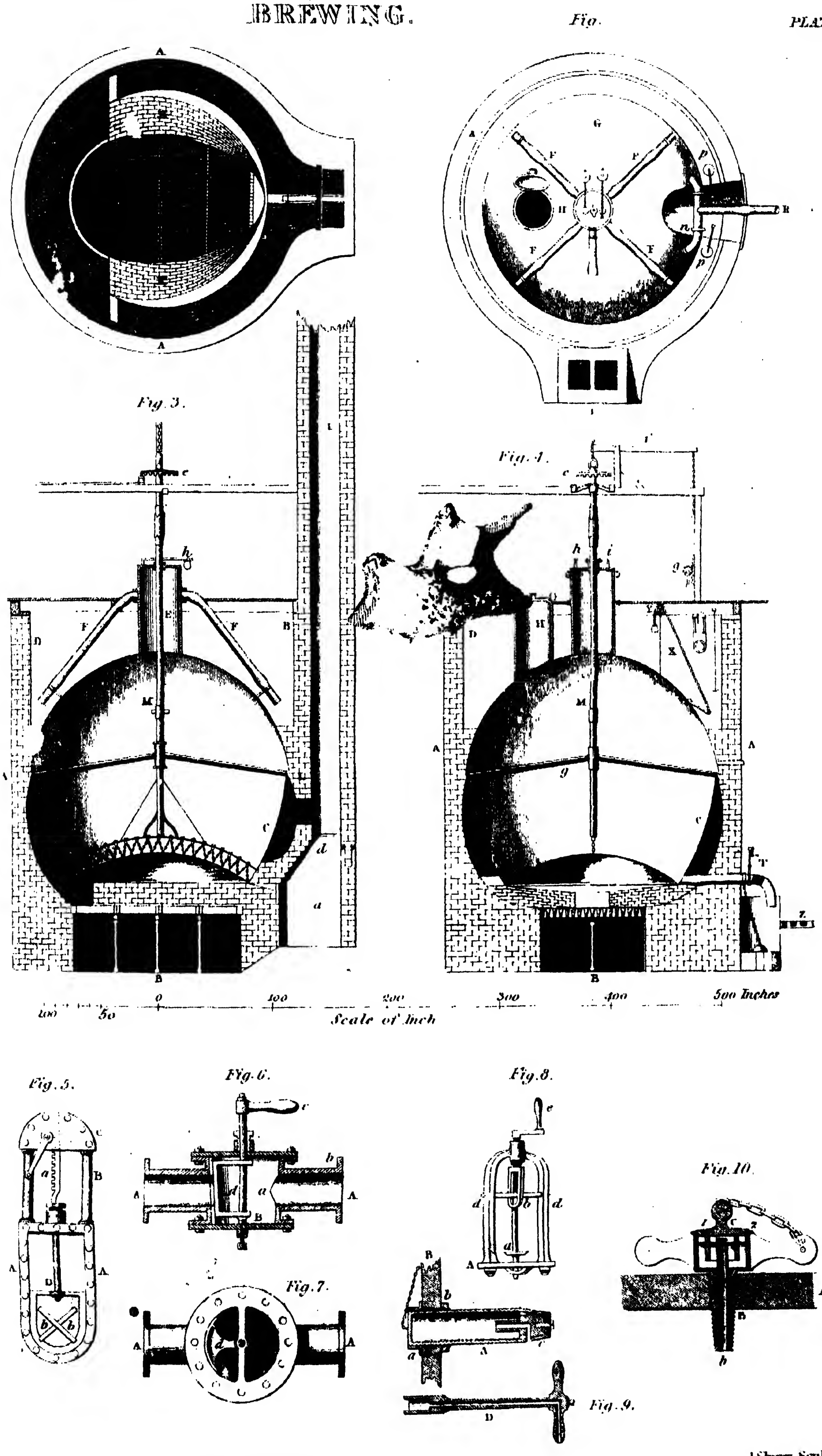


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CLIFFORD.
LORD CLIVE.
CLEVELAND.
CLOVIS I.


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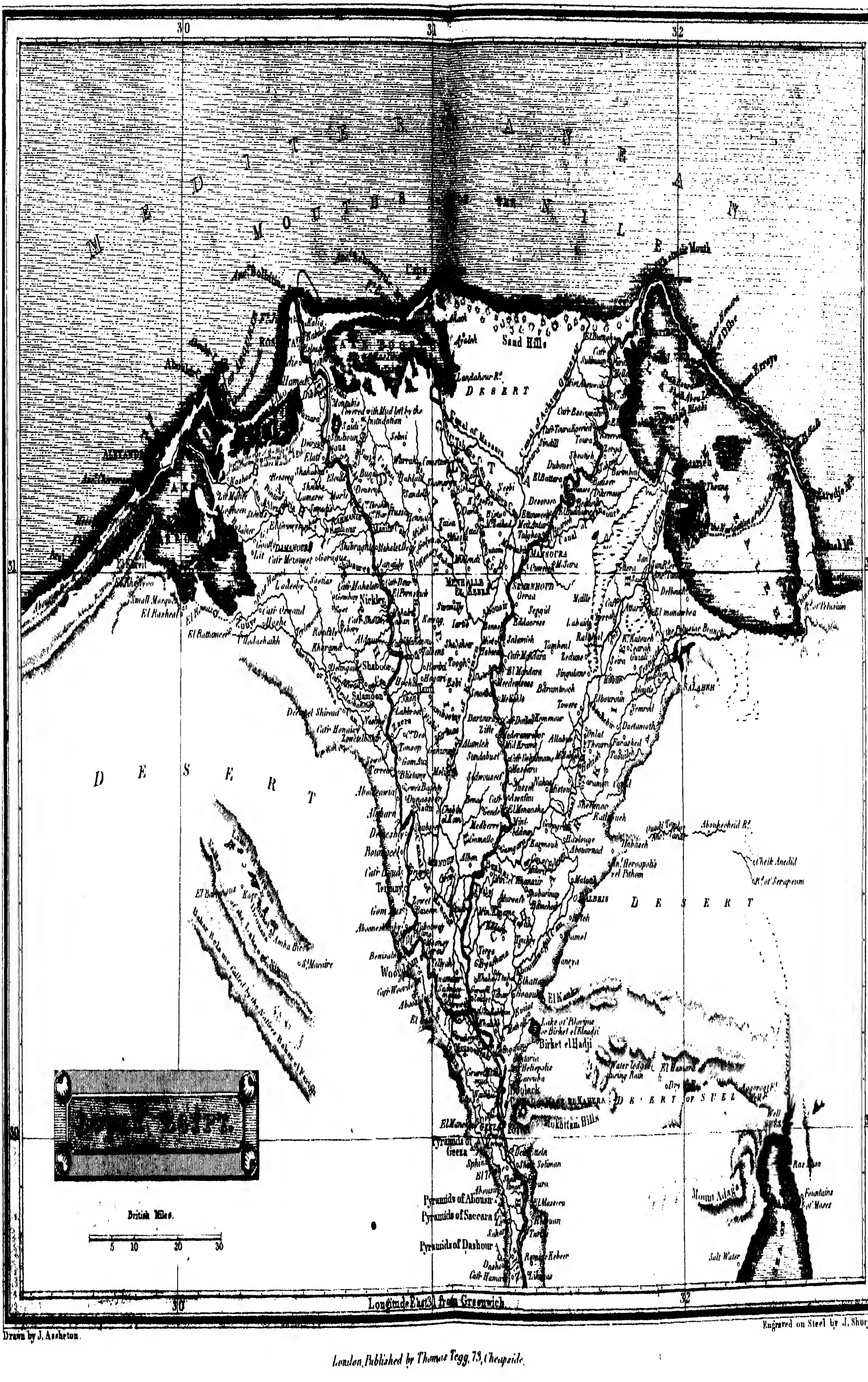
COLLINSON
COLET.
COCKBURN.
T. COKE.
COLBERT.
COECK.
COLIGNI.
J. COLLIER.


CONSTANTINE.
COMMODUS.
CAPT. COOK.
G. COLMAN.
P. DE COMINES.
S. COOPER.
PRINCE DE CONDE.
CHRIS. COLUMBUS.


COPERNICUS.
CORREGIO.
N. COTTON.
CORNWALLIS.
CORTES.
COVERDALE.
C. COTTON.
CORAM.
P. CORNEILLE.

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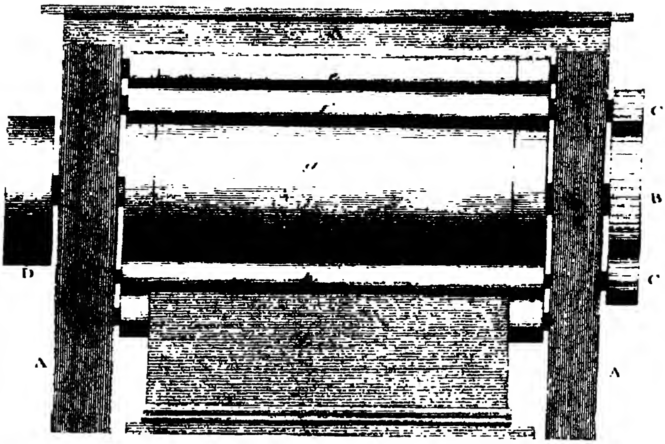
# CALENDERING.

*Fig. 1.*

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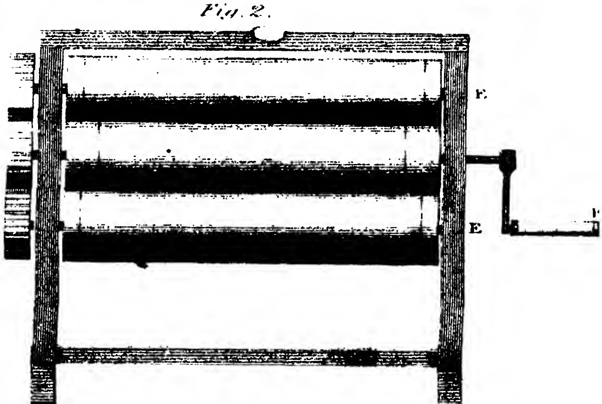


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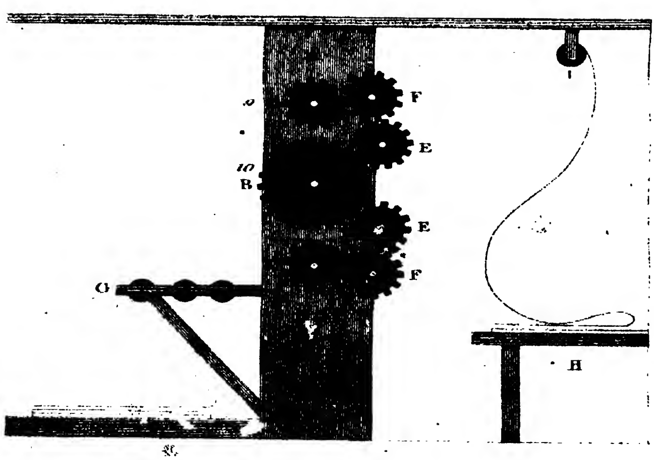


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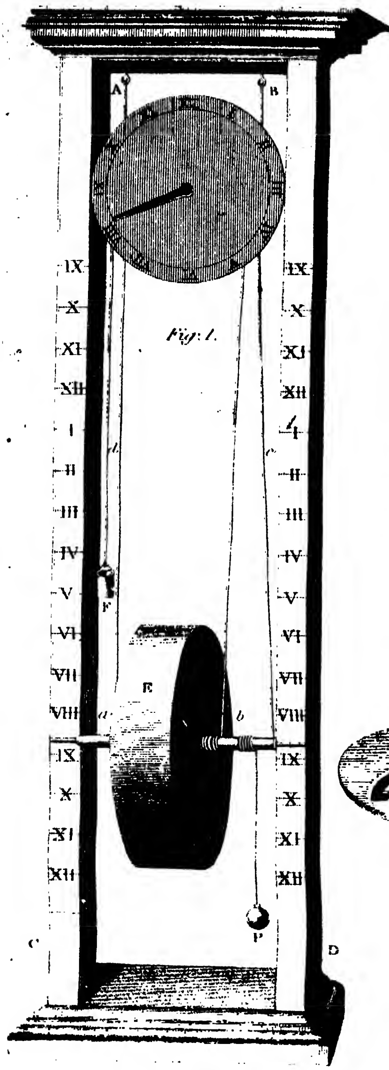
# CLEPSYDRÆ.

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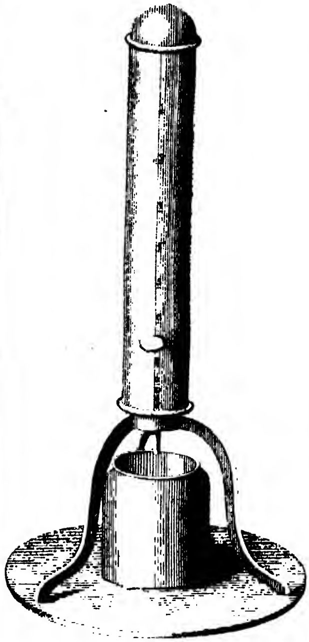

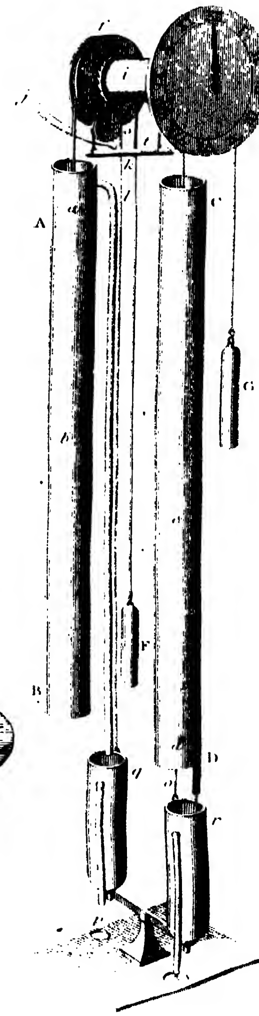


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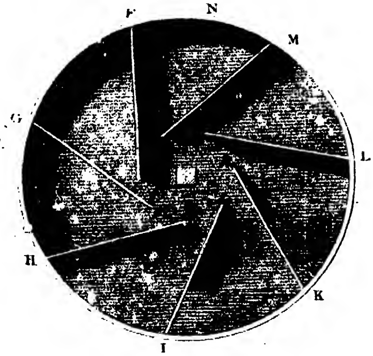


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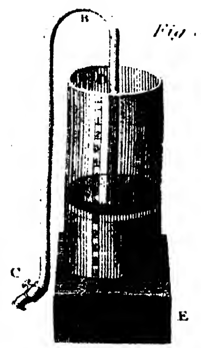


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